

THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEPARTMENT OF AGRICULTURE AND NATURAL RESOURCES
BUREAU OF AGRICULTURE

SEVENTEENTH ANNUAL
REPORT OF THE BUREAU OF
AGRICULTURE

FOR THE

FISCAL YEAR ENDED DECEMBER 31, 1917

ADRIANO HERNANDEZ
DIRECTOR OF AGRICULTURE

MANILA
BUREAU OF PRINTING
1919

CONTENTS.

	Page.
PHILIPPINE AGRICULTURE	9
General summary	9
The food campaign	10
Rural credit	10
Locust extermination	11
The fiber industry	11
Crop conditions	12
Rice	12
Abaca	12
Coconuts	13
Sugar	13
Corn	13
Tobacco	13
Maguey	13
Cacao and coffee	13
Crop prospects	13
BUREAU OF AGRICULTURE	14
Personnel	14
Organization	15
ADMINISTRATIVE DIVISION	16
General service section	16
Accountancy section	16
Records section	18
Correspondence	18
Personnel	18
Property section	19
Personnel	19
Plan of work	19
Publications section	20
Press items	20
Philippine Agricultural Review	20
Philippine Farmer	20
Bulletins and circulars	21
Planotype, mimeograph and library	21
Photographic	21
Statistics section	21
Routine work	21
Distribution	22
Construction and repair section	22
American colonies section	22

	Page.
ANIMAL HUSBANDRY DIVISION	23
General remarks	23
Purchase and sale of animals	25
Feeds and feeding	25
Public livestock breeding	25
Alabang stock farm	28
Trinidad stock farm	29
Horse project	29
Alabang	29
La Carlota	30
Cattle project	30
Alabang	30
La Carlota	30
Trinidad	30
Swine project	31
Alabang	31
Trinidad	31
La Carlota	31
Goat project	31
Alabang	31
La Carlota	32
Sheep project	32
La Carlota	32
Poultry project	32
Alabang	32
La Carlota	33
Trinidad	34
VETERINARY DIVISION	34
Personnel	34
Administration	34
Importation from foreign ports	34
Interisland shipments	34
Inspections for which fees were charged	35
Postmortem inspections, Manila matadero	35
Combating animal diseases	35
Rinderpest	35
Immunization	39
Recommendations	43
Foot-and-mouth disease	44
Contagious pleuro-pneumonia	45
Surra	46
Glanders	46
Hog cholera	46
Anthrax	46
Hemorrhagic septicaemia	46
Livestock importations	47
Iloilo quarantine station	47
Sisiman matadero	47
San Lazaro immunizing station	47
Veterinary research laboratory	47

CONTENTS.

5

	Page.
DEMONSTRATION AND EXTENSION DIVISION.....	49
Agricultural demonstration section.....	49
Administration project	49
Food production campaign.....	51
Rice improvement campaign.....	51
Tobacco production campaign.....	51
Public breeding work.....	51
Cebu demonstration station.....	52
Tabonoc station	53
Iloilo and Capiz project.....	53
Iloilo station	54
Batangas demonstration project.....	54
Batangas municipal nursery.....	55
Lipa demonstration station.....	55
Antique demonstration station.....	55
Demonstration station of San Jose.....	56
Mountain Province and Nueva Vizcaya demonstration project.....	56
Catanduanes (Albay) demonstration project.....	57
Isabela and Cagayan demonstration project.....	57
Ilocos Norte, Ilocos Sur, La Union, Abra and Amburayan demonstration project	58
Tarlac demonstration project.....	59
Bulacan demonstration project.....	59
Bataan and Cavite demonstration project.....	60
Demonstration station of Balanga.....	60
Ambos Camarines demonstration project.....	60
Rizal demonstration project.....	61
Laguna demonstration project.....	62
Santa Cruz demonstration station.....	62
Pangasinan demonstration project.....	63
Nueva Ecija demonstration project.....	64
Pampanga demonstration project.....	64
Mexico demonstration station.....	65
Bohol demonstration project.....	65
Mindoro demonstration project.....	66
Samar demonstration project.....	66
Rural credit section.....	66
Working of associations.....	69
Rural credit agents.....	69
Results	70
Coöperative organization and coöperative marketing section.....	70
Status at beginning of year.....	70
Plan of work.....	71
Insurance section	73
History of the Insurance Section.....	73
Work of the insurance section.....	73
PLANT INDUSTRY DIVISION.....	74
Progress of work.....	74
Corn	75
Rice	76
Progress of work.....	76
General variety test.....	76

CONTENTS.

Page.

PLANT INDUSTRY DIVISION—Continued.

Rice—Continued.

Head-to-row-test	77
Seed propagation work.....	77
Age of seedling test.....	77
Miscellaneous observations	78
Seed distribution	78

Sugar

Progress of the work.....	79
La Carlota station.....	79
Alabang	80
Singalong	80
Lamiao	80
Demonstration stations	80

Forage and cover crops.....

Sorgh ms	81
Sweet potatoes	81
Cowpeas, beans, peanuts.....	81
Guar and grasses.....	82

Tobacco

Permanent improvements at Damiao.....	82
Seed beds	83

Seed distribution

La Carlota station.....	84
Permanent improvements	85
Weather conditions	85
Progress of work.....	85

Singalong station

Equipment	85
Bananas	85
Cotton	85
Forage, root crops, nursery.....	86

Lamiao experiment station.....

Buildings	86
Improvements and repair.....	86
Progress of work.....	87
Tropical fruits	87
Citrus fruits	87
Pineapples	88
Avocados	88
Papayas, mangos	88
Coffee	89
Nursery	89
Plant and seed distribution	89
Vegetables and root crops	89

Pest control section

The locust campaign	90
Work of the provinces	91
Pests and diseases of the coconut palm	91
Research work	93
Rôle of insects in distribution of budrot.....	93

CONTENTS.

7

PLANT INDUSTRY DIVISION—Continued.	Page.
Pest control section—Continued.	
Work in control of pests affecting tobacco	95
Insects and diseases affecting abaca	96
Control of rat plagues	97
Insects affecting rice	98
Fungus diseases	98
Pests and diseases of Sugar cane	99
Pests and diseases of citrus	99
Plant inspection service	99
Educational propaganda	100
Work in Apiculture	100
Coöperative work	100
Acknowledgments	101
FIBER DIVISION	101
Personnel	101
Scope of work	102
Fiber grading and inspection	102
Grading stations and establishments	103
Inspection stations	103
Quantity of fiber graded and inspected.....	103
Receipts and expenditures	104
General remarks	104
Coöperation of United States Government.....	105
Experimental Work	105
Abaca (Manila hemp) investigations.....	106
Repeated variety tests	107
Propagating for distribution	107
Propagating from seed	107
Agave investigations	107
Experimental work	107
Maguey	108
Status of the industry	108
Kapok investigations	109
Experimental work	109
Status of the industry	109
Cotton investigations	110
Miscellaneous fiber investigations	111
CONCLUSION	111

ILLUSTRATIONS.

Plate.	Facing page—
I. A Successful Home Garden, Gapan, Nueva Ecija.....	10
II. Provincial Agricultural Inspector Aguilera's Home Garden	12
III. Coconut grove at San Ramon, Zamboanga.....	14
IV. Field men of the Demonstration Division and Bureau of Agriculture Employees taken at Lamao Experiment Sta- tion, Bataan	14
V. An imported stallion bred at Alabang Station.....	26
VI. (a) Products of Alabang—Four-year-old Grade or Mestizo Work Bullocks	30
(b) Products of Alabang—Pure-bred Indian (Nellore) Bulls. Two years old	30
VII. (a) Products of Alabang Young Berkshires sows ...	32
(b) Products of Alabang—Young Berkshires boars	32
VIII. Products of Alabang—Rhode Island Red Chickens.....	32
IX. (a) Products of Alabang—Barred Plymouth chickens ..	32
(b) Products of Alabang—Artificial incubated chickens in artificial brooders	32
X. Products of Alabang—Indian Runner Ducks.....	32
XI. (a) Carabao sick with rinderpest, at Pandacan Quarantine Station, Pandacan, Manila.	36
(b) Pig sick with rinderpest at Pandacan Quarantine Sta- tion, Manila	36
XII. Immunization Station, San Fernando, Pampanga	40
XIII. Carabao in dipping tank preparatory to release, Immuniza- tion Station, San Fernando, Pampanga.....	40
XIV. (a) Portion of the Municipal Garden and Nursery at the Plaza of Magsiñgal, Ilocos Sur, planted with native cowpeas	52
(b) School boys gardening in the Food Campaign.....	52
XV. Varieties of Rice grown at Alabang, Rizal	52
XVI. Cacao tree about four years old carrying 65 fruits, Pag- sanjan, Laguna	62
XVII. (a) Maize fertilizer plots, Alabang, Rizal.....	80
(b) Cane produced from seed from Louisiana striped cane gathered at Alabang, Rizal.....	80
XVIII. Tobacco, Vizcaya type, grown near Ilagan, Isabela.....	82
XIX. (a) Philippine Islands No. 12 Atemoya.....	88
(b) Ripe Lemon, supposed to be Libson, Lamao Experi- ment Station, Lamao, Bataan	88
XX. Liberian coffee grown at Lamao, Experiment Station, La - mao, Bataan	90
XXI. One typical case of budrot.....	94
XXII. (a) A group of Budrot Inspectors	94
(b) Showing the way how budrot case is prepared for distribution	94
XXIII. (a) <i>Oryctes Rhinoceros</i> L.....	94
(b) <i>Rhynchophorus Ferrugineus</i>	94
XXIV. Effective bamboo guillotine rat trap used by the ppl of Taytay	98
XXV. Pear fruits attacked by moth borer	100
XXVI. <i>Leptocoriza varicornis</i> Fab., sucking the juice of putrified meat	100
XXVII. A group of Government fiber inspectors.....	102
XXVIII. Government Fiber Inspectors making the inspection of bales	102
XXIX. Prieto stripping machine for maguey and sisal.....	108

SEVENTEENTH ANNUAL REPORT OF THE BUREAU OF AGRICULTURE.

MANILA, *February 16, 1918.*

SIR: I have the honor to submit herewith the Annual Report of the Bureau of Agriculture for the fiscal year ended December 31, 1917.

PHILIPPINE AGRICULTURE.

GENERAL SUMMARY.

Among the activities of the Bureau of Agriculture for the year of 1917, deserving of special attention, are: *First*; the big food production campaign carried on by the Bureau under the direction and supervision of the Secretary of Agriculture and Natural Resources, including unprecedented activities in seed and plant distribution, a campaign for rice seed selection, the establishment of nurseries and demonstration plots, home gardens, increased interest in livestock, especially hogs and poultry, and a general awakening of the people to the seriousness of the food situation due to the world war. *Second*; the remarkable advancement made in the establishment of rural credit societies among the small farmers of the Islands, which has exceeded the expectations of even its most enthusiastic supporters. *Third*; the elimination of the locust plague, a condition never before attained in the history of the country. *Fourth*; the satisfactory progress of the inspection and grading of fiber and the establishment of stripping machines for Maguey fiber and the campaign for increased production of this important product. Increased prices for copra, coconut oil, fiber, corn, livestock, rice and all farm products with the possible exception of sugar, have given an increased prosperity to the farmers and to the country as a whole, which bids fair to advance materially during the coming year. Failure to check the ravages of rinderpest is the one drawback for the year of 1917, the loss of work animals proving a serious handicap to agriculture, and the prevalence of the disease absolutely prohibiting any attempt at establishing the much needed coöperative work animal insurance provided by Act No. 2573.

THE FOOD CAMPAIGN.

The energies of the Bureau throughout the year have been centered on the food campaign as the one matter of most pressing importance to the country, due to the war in Europe and the possible food shortage. The appointment of a Government Food Commission which took over the direction of the big campaign for increased production of food products did not lessen the activities of this Bureau, but rather served to stimulate effort, and there has been the heartiest coöperation in carrying out the plans for food production as outlined by the Food Commission and under its immediate supervision and direction, not only in creating interest in increased livestock production, home gardens, poultry, field demonstrations, coöperative plots, nurseries, lectures by the field men and chiefs of divisions of the Bureau, but also by the distribution of seeds and plants on a scale never before attempted by the Bureau of Agriculture, and by the inauguration of a campaign for rice seed selection by forces of trained men in the farmer's fields at harvest time, this campaign extending to most of the leading rice producing provinces of the Islands. Some idea of the magnitude of the seed distribution of this Bureau may be gained from the statement that during the year 1917 a total of 77,527.5 kilos of field and garden seeds were sent out, consisting of 2,931,894 in separate packages besides the seed distributed in bulk. This seed was secured at an approximate cost of over ₱34,000 and an estimated retail value of about ₱300,000. During the past year 6,676 tropical fruit trees of various species, 41,005 coffee seedlings representing 10 varieties and 108,447 various other plants and cuttings were distributed from the Linao experiment station alone, and 688,709 various kinds of economic plants, cuttings, bulbils and suckers were sent out from the Singalong station.

RURAL CREDIT.

As previously stated, the remarkable growth and activity of rural credit associations throughout the provinces have exceeded the expectations of its most enthusiastic champions, and have proven one of the most gratifying and far-reaching achievements of the Bureau during the past year. The movement was in its infancy during the closing days of 1916, but eight rural credit associations having been formed, up to January 1, 1917. On January 1, 1918, there were 84 regularly organized associations with a combined capital stock of ₱409,880, of which ₱41,483 had actually been paid at the time of incorporation, which sum



A successful Home Garden, Gapan, Nueva Ecija.

has been greatly increased, a conservative estimate placing the paid up capital of these associations at close to the ₱100,000 mark at the close of 1917. In addition to the associations already incorporated, 142 other associations were organized during the year, the capital of which has not been entirely paid in, thus for the present delaying their incorporation. The year's results are encouraging. A means has been found whereby the small farmers may be enabled to help themselves by coöperation. Only a fair start has been made as yet but a knowledge of the plan is spreading rapidly and is being readily accepted. It is sure to grow if carefully managed because rural credit meets an urgent and pressing need.

LOCUST EXTERMINATION.

It is a source of great satisfaction to be able to announce that the Islands are now free from locust invasions and have been thus free for a period of several months. On July 28, 1917, the Archipelago was declared free of locusts, and except for a few scattered swarms that were promptly destroyed upon their appearance, the country has been free ever since, and from September 22, 1917, no locust swarms have been reported anywhere in the Archipelago, a condition that has not existed before during modern times.

THE FIBER INDUSTRY.

Fiber grading and inspection during the year were conducted in a most satisfactory manner. During the year 34 grading stations and 101 grading establishments were designated, an increase of four stations and four establishments over the previous year. Of the 101 establishments, only 24 still use special house marks for each grade of the Government standard. Government inspectors during the year inspected, stamped and approved 1,291,851 bales of abaca (Manila hemp), 113,579 bales of maguey and sisal and 1,553 bales of pacol and canton. A total of 21,228 bales of abaca and maguey were rejected as not being up to the proper standard. A grand total of 1,406,983 bales of fibers of all classes were produced during the year, an increase of 101,831 bales over the total of the previous year. In order to stimulate the production and increase the quality of Maguey fiber, two Prieto fiber extracting machines were purchased and installed at the Singalong experiment station, where extensive experiments and tests were made before sending the machines to the provinces for demonstration work. The results obtained were very satisfactory, and fiber experts assert that these ma-

chines will give good results and greatly increase the maguey industry throughout the Islands and place it on a more staple basis.

CROP CONDITIONS.

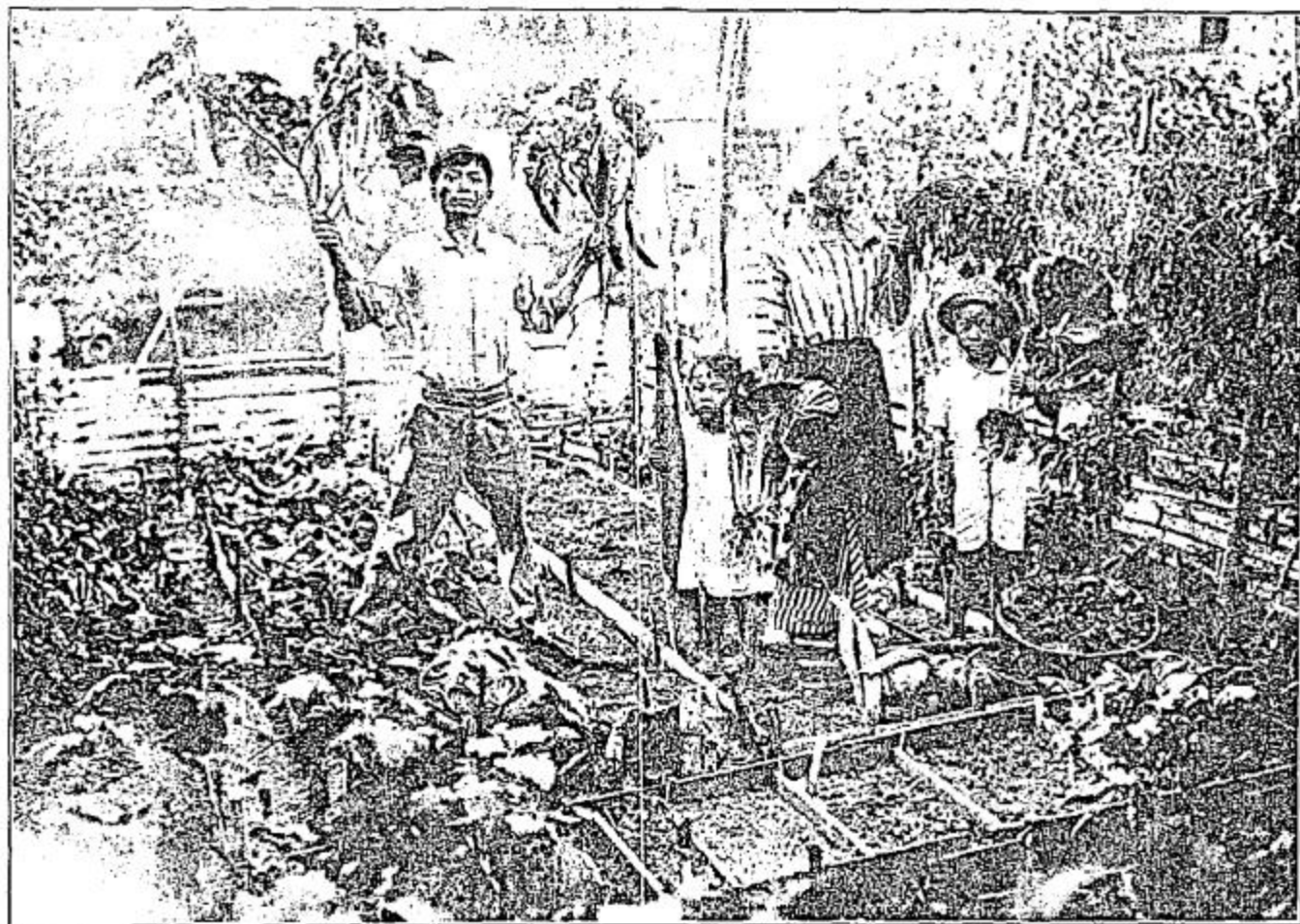
The following report on crop conditions is for the year ending June 30, 1917. The figures given are preliminary and are subject to more or less alteration in the final estimates of the statistical section.

The agricultural year, June 30, 1916, to June 30, 1917, was an exceptionally good one for nearly all staple crops. During the year only one typhoon of importance visited the Islands, passing over the northern part of Luzon and the Babuyan group. Storms of lesser degree were reported in northern Mindoro, northern Samar, southern Sorsogon, Balintang Channel and a few other localities, but little damage to crops resulted. Heavy rains fell during the year in nearly all parts of the Islands, but particularly in Mindanao, the Visayas and Northern Luzon, causing rather heavy damage to sugar cane, tobacco and corn, although the damage by rains and floods was not so great as in the previous year. The greatest damage reported was that of the sugar crop in Negros and Panay, yet the excessive rains there were favorable to coconuts, abaca, rice and maguey.

In last year's annual report the prediction was made that in view of good crop prospects and probable advance in prices, the total value of the nine staple products of the Islands for the year 1916-17 would come close to the ₱200,000,000 mark. It is gratifying to state that this production has been more than realized, the total value of crops for this period being ₱234,000,000. This remarkable increase as compared with the ₱181,700,000 for the previous year of 1915-16, ₱160,419,060 for 1914-15, ₱165,013,832 for 1913-14 and ₱178,639,668 for 1912-13, is due to some extent to increased production, but in a greater degree to the great advance in prices.

Rice.—During the year there were harvested, in round numbers, 1,939,000,000 liters of rough rice, worth ₱72,500,000, which represents an increase of over 23 per cent above last year's production and nearly 30 per cent over the value of the crop of the previous year.

Abaca.—Next in value comes abaca, with a production of about 155,730,000 kilos, which is only an increase of about 1 per cent in production over the previous year, yet showing a total value of ₱60,722,000 which is an increase of nearly 42 per cent over the value of the previous crop.



This picture shows the southern end of Provincial Agricultural Inspector Aguilera's small home garden. The garden is so complete in vegetable crops that the owner's table is well supplied with the vegetables raised every day. The two small boys shown in the picture, sons of the Provincial Agricultural Inspector, greatly helped in the upkeep of the garden. Note the vegetable products shown here.

Coconuts.—The total value of this crop amounted to ₱32,860,000 or ₱8,430,000 more than was paid for the previous crop, the yield being 887,000,000 nuts and 42,600,000 liters of tuba. Of the total number of nuts, 63,360,000 were used for food and the remainder were used for copra and coconut oil, producing 186,227,000 of copra and 2,600,000 liters of oil. Compared with the previous year, there is an increase of 31 per cent in copra and 3 per cent in oil.

Sugar.—The production of sugar was 365,000,000 kilos of crude sugar and panochas, worth ₱32,850,000, which shows a decrease of 2 per cent as compared with the crop of 1915-16, due mostly to continuous heavy rains.

Corn.—This crop also registers a decrease of nearly 5 per cent in production compared with that of last year, but the crop is worth approximately 20 per cent more than that of last year, the total value being ₱17,640,000.

Tobacco.—The total tobacco production was 47,000,000 kilos worth ₱11,637,000, which is an increase of 14 per cent in production and a gain of ₱4,378,000 in value over the crop of the previous year.

Maguey.—The production of maguey this year was 23,629,000 kilos, valued at ₱4,962,000, an increase of 76 per cent in production over the previous year and of 184 per cent in the value, a creditable showing indeed, and one which shows the possibilities and growing importance of this valuable product.

Cacao and Coffee.—These are crops of relatively minor importance but both show in increased production for the year. The yield of cacao was approximately 600,000 kilos, and of coffee 800,000 kilos, with a value of ₱382,000 for cacao and ₱397,000 for coffee.

CROP PROSPECTS.

From present indications, the new agricultural year of 1917-18 will be the most successful year ever recorded for all crops with the possible exception of sugar. It is estimated that the total rice production for the coming year will be close to 30,000,000 cavans of rough rice if the season continues favorable, yet in spite of the extraordinary increase in production during the past year and the promises of even greater production for 1917-18, there is a steady advance in the price. Prices of cleaned rice per cavan in December, 1916 in the following rice centers, were: Nueva Ecija, ₱6 to ₱6.20; Tarlac, ₱6; Pampanga, ₱6 to ₱6.20; Bulacan, ₱6.20 to ₱6.40; Iloilo, ₱6.60 to ₱7. In the same month of 1917 the prices were:

SEVENTEENTH ANNUAL REPORT

Nueva Ecija, ₱7.40 to ₱7.50; Tarlac, ₱7.50; Pampanga, ₱9.50 to ₱10; Bulacan, ₱7.50 to ₱8; Iloilo, ₱7.50 to ₱8.40, an advance for the year ranging from ₱1.70 to ₱2.50 per cavan.

The serious damage to abaca and coconut plantations by the floods and typhoons of 1915 and early in 1916 have about disappeared, owing to favorable weather conditions since that time and to the care given plantations by the people who were encouraged by the constantly advancing prices. Many of the growing coconut trees are again coming into bearing and greatly increased production is predicted for 1918. It is also hoped that abaca production will show a satisfactory increase.

Considerable areas are being planted to maguey, a crop which is receiving particular attention at this time, owing to an ever increasing demand for this fiber, consequent profitable prices, and its adaptability to adverse climatic conditions. It is expected that many new areas will come into production during the year and under these splendid prospects an increase of at least 25 per cent in production may reasonably be expected.

Heavy production of tobacco is also expected. This crop is receiving great attention in many districts where it has heretofore been produced only on a small scale. Seed beds are already transplanted and the young plants are growing fine in most localities, all of which promise a large yield for 1918.

A normal crop of corn is expected, which will equal and may possibly show a slight increase over the figure for 1917.

Despite present unfavorable conditions in the sugar-producing districts of Negros and Panay, it is believed that the next crop will show an increase of from 5 per cent to 10 per cent over the crop of 1916-17, as fairly good conditions are reported from the other sugar districts where large areas are in cultivation.

BUREAU OF AGRICULTURE.

PERSONNEL.

There were no changes in the Directorate of the Bureau of Agriculture during the year of 1917. During the fiscal year, 14 American employees were appointed, of whom 6 were permanent and 8 were temporary. In the American personnel 32 employees were separated from the service through resignation during the year, 13 being from the permanent service and 19 being temporary employees, a reduction of 7 in the permanent personnel and 11 in the temporary list.

During the same period 521 Filipino employees were appointed, 80 being permanent and 441 were temporary, and



Coconut grove at San Ramon, Zamboanga.

there were separated through resignation 450 employees, of whom 20 were permanent and 430 were temporary, or an increase of 60 in the permanent personnel and an increase of 11 temporary employees. The increased force in the permanent personnel was due largely to the increased activities in the food production campaign and the rural credit section. It was also necessary to employ many livestock inspectors on account of the seriousness of the outbreak of rinderpest which continued unabated throughout the year.

ORGANIZATION.

There were no important changes in the organization of the Bureau during the year, only one new section being created, that of records section, under the administrative division, necessitated by the increased duties and importance of this work. Aside from this, the organization for the year has been practically that adopted August 1, 1916, at the suggestion of the Efficiency Committee and is as follows:

ADMINISTRATIVE DIVISION.

General service section.

Accountancy section.

Records section.

Property section.

Publications section.

Statistics section.

Construction and repair section.

American colonies section.

ANIMAL HUSBANDRY DIVISION.

Improved breeding section.

Animal selection and distribution section.

Poultry selection and distribution section.

VETERINARY DIVISION.

Disease control section.

Quarantine and meat inspection section.

Veterinary research section.

PLANT INDUSTRY DIVISION.

Agronomy section.

Horticulture section.

Pest control section.

FIBER DIVISION.

Fiber investigation section.

Fiber inspection section.

DEMONSTRATION DIVISION.

Agricultural demonstration section.

Coöperative organization and marketing section.

Rural credit section.

Insurance section.

ADMINISTRATIVE DIVISION.

GENERAL SERVICE SECTION.

The business of this section which in fact corresponds to that of the office of the chief clerk in most bureaus, which includes the general supervision of the stenographic work, dictation of official correspondence, general transportation supervision, the making up of the estimate for the annual appropriation and the allotting of the same, keeping the efficiency records of all Bureau employees, supervision of property, accountancy and records, directly responsible to the chief of the Administrative division, rental of buildings, light, water, janitor service, etc., has been carried forward during the past year in a very creditable manner. Mr. Iram P. Short, first assistant chief of the administrative division retired from the service February 28, 1917, and Mr. Francisco Guerra was promoted to this important position, and Mr. Mariano Chavarria was appointed to the position of second assistant chief of the division, vacated by Mr. Guerra's promotion.

ACCOUNTANCY SECTION.

Eleven clerks were appointed to this office and eight were separated therefrom during the year. There are at present two vacant positions, one at \$960 and one at \$780 per annum.

This section has recorded expenditures by projects and submitted monthly statements therefrom to the chiefs of divisions and sections but this was discontinued on October 1, 1917. During the rest of the year only monthly statements showing the financial condition of each division were submitted.

This section is divided into sub-sections as follows: Collection and disbursement, auditing, requisition, colony accounts, book-keeping, and general service. Each clerk is assigned to a particular work in each sub-section but sometimes it was necessary

to shift them from place to place where the work needed an immediate attention.

At the beginning of the year the Insular Auditor inaugurated a new system of classifying and journalizing accounts and keeping books. This system increased considerably the work of the bookkeeping subsection.

On June 22 to September 4, 1917, the Chief Accountant visited the American colony at Momungan to instruct the new assistant colony agent in keeping books and recording transactions as well as to find out the origin and cause of the ₱10,452.98 accounts receivable (sales of produce). While at Momungan, the colonists account-current ledger of Momungan was checked with that of Manila. A pass book showing September 1, 1917, balances of their indebtedness was also issued to each colonist as it was learned that none of the colonists knew the status of their indebtedness to the Government. The cash account of the colony agent was audited and it was found out that there were many disallowances in prior year which were never adjusted on account of not knowing what to do and how to adjust. These disallowances were adjusted and passed by the chief accountant. Under the old system of accounting, the merchandise account could not be checked up, so a new system of keeping merchandise and produce account by means of card was introduced. This was approved by the Insular Auditor. A physical inventory of merchandise, produce, and fixed assets was then made. The ₱10,452.98 stated above originated from an inadequate system of recording transactions installed. The Auditor adjusted the amount and a new system of accounting was introduced.

The following table indicates the number of warrants, etc., prepared during the year:

Warrants	15,130
Journal vouchers	1,200
General vouchers, paid by the cashier and disbursing officer.....	1,164
Official receipts issued	16,280
Delivery orders issued	91
Regular requisition, Bureau of Supply	149
Rush requisition, Bureau of Supply	147
Regular requisition, Bureau of Printing	203
Rush requisition, Bureau of Printing	21
Direct orders	574
Work orders and miscellaneous orders	671
Approximate number of items on requisition for which cards were prepared	5,500
Number of sheets of salary abstract.....	200

Number of sheets of sundry abstract	600
Number of sheets of journal	500
Number of sheets of project ledger (discontinued).....	293
Number of sheets of subsidiary ledger	282
Number of sheets of general ledger	158
Number of Bureau bills	1,100
Number of sheets of memorandum re disallowances	2,550
Number of kilos of sweet potatoes sold at Manila	1,594
Number of kilos of peanuts	1,815

During the year, there are about 2,550 traveling expense accounts of the Bureau of Agriculture employees that showed disallowances, although Service Manual was issued to each field man in charge.

RECORDS SECTION.

During the year there has been an increase of 108 per cent in the correspondence handled by this office over that of the preceding year. The work of the section has been increased greatly, due to the activities of the food production campaign and the rural credit section. A spirit of excellent coöperation has prevailed among the employees of the section, a fact very essential to successful administration.

No change has been made in the system of recording (vertical system) adopted by this Bureau four years ago. Although the system is not so efficient as that of the numbering system, yet the result has been satisfactory. The advantage of this system over that of the numbering system is that it requires much less money and personnel to carry out the work of the section.

Correspondence.—During the year there has been a total of 256,135 communications sent and received of which 230,405 letters were outgoing and 25,730 incoming, as against a total of 122,592 communications sent and received during the preceding year, an increase of 133,543 or 108 per cent. Letters from school children and forms from our field men are not included. There were 11,797 letters delivered by messengers to different Departments and Bureaus in the city as against 7,352 in the preceding year. The cost for the transmission of correspondence has been ₱7,189.64 for letters and ₱2,693.92 for telegrams, a total of ₱9,881.56, as against ₱7,330.36 in the preceding year, an increase of ₱2,551.20.

Personnel.—During the first quarter when the section was still attached to the general service section its personnel consisted of one record clerk, one assistant record clerk, 7 clerks, and two messengers. On April 1, 1917, the section was separated from the general service section, and its personnel, until the closing

of the year, consisted of one section chief, one assistant chief, eleven clerks and two messengers. During the year there were 10 appointments and four separations.

PROPERTY SECTION.

Personnel.—At the beginning of the year, the personnel of the property section was composed of one chief, an assistant chief, three clerks, one semi-skilled laborer and eight laborers. On January 8, the chief retired from the service and the Assistant succeeded him as chief of the section. One clerk and one laborer were appointed on March 16 and 23 respectively. On April 1, the semi-skilled laborer was promoted to chauffeur. On June 1, one clerk transferred to the fiber division leaving a vacancy which was not filled until September 1.

Plan of work.—This section is in charge of the property of the Bureau of Agriculture. It accounts for the same and supervises all transactions in connection therewith. A system of ledger cards is used to represent the property accountability of the Bureau of Agriculture. These ledger cards are checked monthly with the books of the Bureau to insure the accuracy of the property accounts. In order to insure the correctness of the status of the property located at the various provincial stations as represented by the ledger cards, station superintendents are required to submit semi-annual inventories of equipment and animals at their respective places. Non-expendable property issued to employees is accounted for through memorandum and invoice receipts. Expendable property is likewise accounted for through a medium of supplies' cards which are in continuous check with the existing stock. No issue of supplies or equipment of whatever nature is made without properly approved requests. To facilitate the work of the section pertaining to the issue of supplies, equipment, etc., and to regulate the work on an efficient basis, issue of stationery, equipment, etc., to central office employees is made once a week only. Through this medium the work of the storeroom is being standardized. Thus, while one day is set for the issue of stationery, etc., to the central office force, the remaining working days of the week are set apart for the preparation for shipment of supplies, equipment, animals and plant materials to the field employees of the Bureau and to private parties throughout the Archipelago.

All shipments of whatever nature, whether intended internally or for foreign ports are cleared through this office. While the routine clerical work is a little more than usual, the shipment of

seeds and other plant materials were more than double as compared with the past year. The purchase of merchandise for the American colony has also become a notable item in the work of this section.

PUBLICATION SECTION.

The work of this section embraces the publication and distribution of the Philippine Agricultural Review, a publication in English, issued quarterly; the Philippine Farmer, a monthly publication in English and Spanish; the publication and distribution of all bulletins, circulars, pamphlets and press notices; the supervision of the Bureau of Agriculture library; Bureau photographic, planotype and mimeograph work and miscellaneous transactions.

Press items.—No accurate record has been kept of the number of items given to the Manila papers during the year. However, the market, locust and rindespest reports have been given to press representatives who call at the central office, and a copy of each regular report was also mailed to 21 provincial newspapers.

Philippine Agricultural Review.—The regular distribution of the review averaged 941 copies distributed every quarter. The number of paid subscription amounted to 156.

A total number of 152 foreign and local periodicals were received in exchange for the Review.

An average of 660 free copies were distributed quarterly to Government institutions abroad and to private individuals.

The quarterly distribution of Review for 1917 was as follows: Foreign countries, 319; United States and Territories, 341; Philippine Islands, 281.

FOOD PRODUCTION NUMBER.



The Philippine Farmer.—The editing of this publication has been carried on as usual by the chief of the section, as well as the supervision of mailing the same. A change was made during the year from the former plan of issuing this publication in equal number of English and Spanish, and it has been

regularly issued one-third of the total number in English and the remaining two-thirds in Spanish.

Bulletins and circulars.—During the year but one new circular, No. 36, "The Vegetable Garden," by A. M. Burton, was published, 10,000 copies in English being printed. Numerous reprints were made of former circulars and bulletins of which the supply had become exhausted.

Planotype.—During the fiscal year of 1917 delivery was made on a total of 108 orders amounting to 16,140 printed copies.

Mimeograph.—During the same period there were 584 work orders for the mimeograph with a total of 514,020 printed copies.

Library.—A total of 1,665 bound volumes and 6,614 pamphlets were on hand at the close of the year 1917. Owing to the fact that the librarian was granted leave of absence to visit the United States, the cataloging has been delayed. Only 180 separate publications were catalogued during the year and 411 cards have been added to the list. During the same period 70 volumes of periodicals were bound. Many more volumes are complete and ready for the bindery.

Photographic.—A total of 5,003 prints were made during the year, 1,240 photographs have been enlarged, 138 lantern slides were made, also 50 colorings and 32 transparencies. A total of 427 plates, 23 films, 20 rolls and 48 cut films were developed.

STATISTICS SECTION.

The force of the section at present consists of one chief, two junior topographical draftsmen; two junior stenographers, twelve permanent employees and two temporary copyists.

Routine work.—The routine work of the section has been confined, as always, to the compilation of the returns contained in the reports submitted by municipal presidents as required by legislation. There are at present in the Philippines 901 municipal presidents of localities who submit four quarterly and two semi-annual reports, and 56 governors of provinces and sub-provinces who submit 12 monthly reports, each year, making altogether 5,080 reports received by the section with a total of 669,126 replies. The transcription of these replies into tables requires a considerable amount of work and time. Once these replies are arranged in tables by crops and by animals, local measures are reduced into legal ones and the average yields per hectares, the average prices and the total values are found. If one bears in mind that tables for nine kinds of crops and six kinds of animals are prepared for each one of the 901

localities, it can be seen that the tabulation of these replies is an enormous task.

During the year, there has been a considerable amount of correspondence, between this office and the offices of the municipal and provincial governments, on account of the delay in submitting the reports they were required to make by legislation. The return for correction or further information of reports has involved also an extra work that increased greatly the number of letters transacted. The drafting branch of this section has shown also a remarkable activity during the year. On account of the food campaign carried on by the Government, this section has been requested to prepare maps bearing information on the matter, and several elaborate maps were prepared for the offices of His Excellency the Governor-General, the President of the Senate, the Speaker of the House of Representatives and the Department, as well as numerous signs and much other miscellaneous work.

Distribution.—The compilation of returns for 1916, was completed during the early part of February of this year. Immediately after, this section received a considerable number of requests therefor that has indicated a keener desire on the part of the public to know the agricultural wealth of these Islands. Numerous copies were distributed as well as many letters bearing miscellaneous questions on crops and animals have been answered.

CONSTRUCTION AND REPAIR SECTION.

This section has charge of the up-keep and repair of all Bureau transportation and machinery, repair and manufacture of office furniture and equipment and the construction and repair of buildings belonging to the Bureau of Agriculture. This station received and accomplished 176 serial and work orders for repair and manufacture of office furniture, etc. There were 66 repair orders and 55 furnish orders of bicycles, 69 repair orders and 76 furnish orders for motorcycles and 22 repair orders and 11 furnish orders for automobiles, during the year. In operation and maintenance for six (6) passenger automobiles and two (2) White trucks during the year, for gasoline, oil, grease or lubricants and auto accesories, the total expenditure amounted to ₱11,241.87.

AMERICAN COLONIES SECTION.

Of the total of 60 homesteaders in the American colony at Momungan at the establishment of the colony, 33 remained at the close of the year 1917. A transcript from the records of

the accounting section of the Bureau of Agriculture shows that in accounts current with these colonists the Government has advanced to them for various purposes the total sum of ₱96,044.31. Of this they have repaid in all, the sum of ₱45,994.66, leaving a balance due of ₱50,049.65. The total cash funds available for the colony at the close of the year 1917, was ₱19,350.22. The value of colony building is ₱6,319.70, equipment ₱1,627.30, merchandise ₱11,128.52.

The total organization expense for the colony is ₱28,219.22. Up to the present time no attempt has been made to reduce this organization expense, the produce and payments turned in by the colonists being applied to the reduction of their individual indebtedness to the government, designated as "Accounts Current."

As will be noted in the beginning, many of the colonists have left the colony, having given up the struggle or been separated from the colony as undesirables. The accounts of a few of these settlers have been remitted by executive action. An attempt is being made to effect some sort of a settlement with the others on liberal terms. The departure of these colonists has left vacant homesteads, and a decision was made during the past year by the Honorable, the Secretary of Agriculture and Natural Resources, to admit Filipino colonists to these homesteads on practically the same terms and conditions as were made to the original homesteaders. As a result a few Filipino homesteaders have been admitted to the colony and more would be added if funds were available. The colony can hardly be designated as a prosperous one, yet considering the disadvantages and discouragements incident to any pioneering project, they have done fairly well, and it is hoped that their worst difficulties have been overcome and that those who remain as well as those newly admitted, will prosper in the years to come.

ANIMAL HUSBANDRY DIVISION.

General remarks.—The demand for livestock has been exceedingly large and this demand could only be supplied to a limited extent during the greater part of the year. Owing to the plan of establishing stations in the provinces in connection with the food campaign during the last three months of the year, the sales had to be practically discontinued in order that there should be sufficient breeding stock on hand for these new stations. These stations will in the main be of a temporary character

and primarily for the production and distribution of swine and poultry, but might also comprise public breeding of large animals.

During the year one new station was established at Cebu and another will soon be in operation at Iloilo provided funds are available. The breeding station at Virac, Catanduanes, will be discontinued but the work in other localities throughout the Islands will be greatly extended and conducted on a much larger scale if present plans are carried out.

The above plan presupposes the necessity of the importation of livestock in the shortest possible time and regardless of cost. A shipment of Indian cattle from India was received in Manila last April by a local firm. A part of this shipment was for the Bureau of Agriculture. The unsatisfactory conditions on shipboard, as well as the time consumed on the voyage to Manila, resulted in the livestock arriving in very poor condition. However, the demand for them was so great that not withstanding their condition and the high prices demanded, there was a rush for them by livestock raisers, before and immediately after they were immunized to rinderpest and the quarantine was raised. At the present time there is still a long list of persons who urgently request this kind of cattle.

The results relative to the importation of fowls from the United States, were satisfactory, but the same cannot be said of the Cantonese chickens imported from China, where dealers do not interest themselves as to whether the chickens are good, bad or indifferent, and send the birds out improperly crated. As a result many fowls are lost by being stolen in transit and many die while under confinement. At present the animal husbandry division has standing orders for poultry and swine from the United States and Australia which it is expected will arrive during the next year. There is a notable shortage of eggs and poultry throughout the Archipelago as evidenced by numerous reports received and also by the great increase of from 40 per cent to 50 per cent in prices in the Manila and provincial markets.

The correspondence of the division has increased greatly over that of previous years, due to the fact that the people are every day becoming aware of the importance of the livestock industry in connection with food production. Their inquiries have largely been concerning care and management, feeds and feeding, public breeding, and the purchase and sale of poultry, cattle and hogs. But little interest has been shown by farmers in the breeding of horses, sheep and goats.

A few articles in regard to swine and poultry were prepared by the division and published in the Philippine Farmer, which aroused considerable interest among readers of the paper. Several trips of inspection were made by both the chief and the assistant chief of the division to various stations during the year. There have been many conferences with farmers and prominent officials on subjects pertaining to the work of animal husbandry.

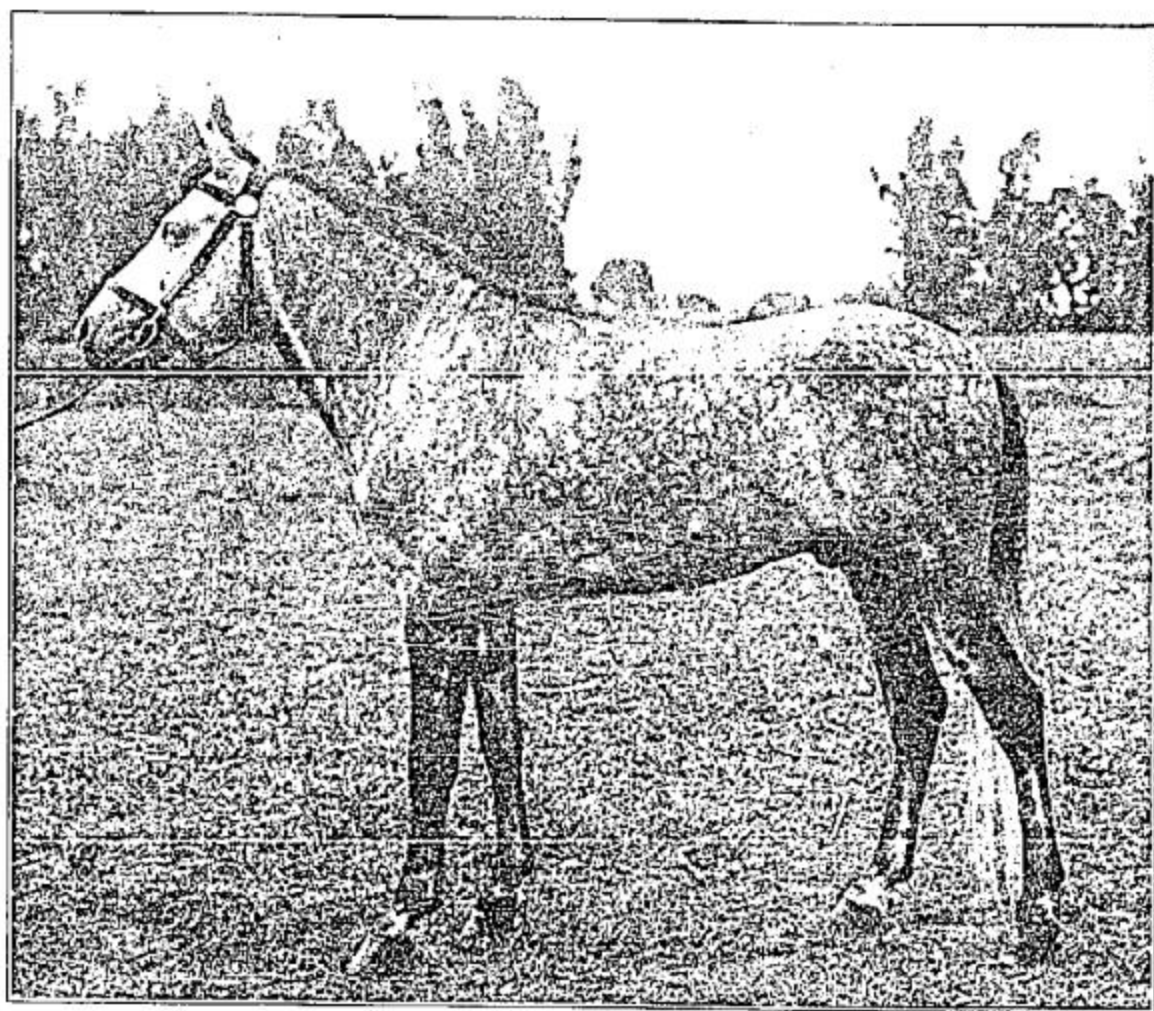
Purchase and sale of animals.—During the past year there were sold by the Bureau, 54 cattle, 3 carabaos, 174 swine, 16 goats, 3 sheep, 400 poultry, bringing in a total revenue of ₱9,872.50. During the same period the livestock purchased consisted of 54 horses and mules, 161 cattle, 95 carabaos, 6 swine, and 61 poultry, a total cost of ₱30,742.52. For other branches of the Government the Bureau purchased 32 horses, 13 cattle at a cost of ₱7,366.

Feeds and feeding.—The increased work of the animal husbandry division has prevented much research work as regards feeds and feeding. The price of imported feeds is absolutely prohibitive and therefore must be substituted by products of local origin, and even these products are at present so high priced as to seriously suggest the need of government legislation and control. There is a noticeable shortage of feeds for livestock throughout the provinces. The price of corn has increased during the year from about 6 centavos at the beginning of the year, up to 10 and even 12 centavos at the close. Palay and tiqui-tiqui have likewise advanced materially in price. Copra meal is coming into more general use. Tests of feeding meal from several factories were made at Alabang during the early part of the year with very satisfactory results. The amount of forage produced at Alabang this year was larger than could be consumed on the farm. We were therefore enabled to supply the Bureau of Prisons with 9,119 kilos, the Philippine Oil Company 30 tons and an equal amount to the veterinary division. There is still on hand at Alabang a surplus of Japanese forage cane available for other stations. The pastures at La Carlota and Trinidad have been in good condition throughout the year.

Public livestock breeding.—This project is very popular among the people and is attracting a great deal of their attention. Many applications for bulls, boars and stallions are being constantly received from private parties and municipalities, which could not possibly be filled this year and unless the number of animals is increased next year the same conditions will prevail.

The policy of requiring municipalities certain requirements before being allowed to have animals for public breeding purposes has greatly ameliorated the death rate and condition of the animals for public use. However, when compared with animals under the charge of Bureau employees they are poor; for the latter not only have the animals in better condition but also have shown and given much better results. This fact proves conclusively that unless they can be placed directly in the hands of Bureau employees it is always best to sell them. Notwithstanding, the work has been satisfactory and decidedly better than in previous years as may be seen from the inventory given below of the public breeding animals together with their location and breeding records.

Location.	Property number of sire.	Kind of sire.	Number of services.	Number of offspring.	Remarks.
Albay:					
Ricol farm	123	Stallion.	33	11	
Do	B-12	do	2	3	
Do	D. of A.	do	17	8	
Do	A-21	do		2	
Do	412	Bull			
Antique:					
San Jose	B-1	do			
Batangas:					
Batangas	B-98	Stallion.	70	16	
Do	197	do	89	30	
Do	219	do	87	22	
Do	67	Boar	61	1,023 pigs	Dead.
Do	357	do	239	1,951 "	
Do	329	do	111	350 "	
Lipa	73	Stallion.	66	14	
Do	B-79	do	82	29	
Do	398	Bull	16	3	
Do	199	do	12	12	
Bulacan:					
San Miguel	352	Boar	16	5 liters	
Cagayan:					
Tuguegarao	864	Stallion.			
Do	3,791	Bull	39	29	
Batanes Island Basco	B-91	Stallion.			
Capiz:					
Odiongan forest station	386	Boar			
Cavite:					
Indang	311	do			
Cebu:					
Cebu	A-21	Stallion.	52		
Do	194	do	62		
Do	190	Boar	15	3	
Do	305	do	12	26	
Do	191	do			Dead.
Do	328	do		2	
Do	399	do	1		
Do	258	do	1		
Do	327	do	82	59	
Do	188	do	21	30	
Do	187	do	24	36	
Do	306	do	67	32	
Do	307	do	53	32	
Do	325	do	39	62	
Do	309	do	26	29	
Do	304	do	53	39	
Do	303	do	17	45	
Do	308	do		2	
Ilocos Norte:					
Bacarra	330	Boar	25	5	
Dingras	192	do	8	8	Dead.



An imported stallion bred at Alabang Station.

Location.	Property number of sire.	Kind of sire.	Number of services.	Number of offspring.	Remarks.
Ilocos Sur:					
Currimao	385	Boar	3		
Lagangilang	238	do		7	
Sinait	398	do	82	3	
Vigan	397	do	10		
Cabugao	275	do	47		
Magsingal	229	do	21		
Lapog	440	do			
Iloilo:					
Iloilo	446	Stallion	13		
Do	419	Bull	17		
Do	420	Billy	14		
Do	170	Boar	48		
Do	87	do	73		
Do	367	do	6		
Do	368	do	20		
Do	424	do	3		
Do	386	do	7		
Isabela:					
Angadanan	230	Boar	20		
Tumauini	233	do	9		
Laguna:					
Calamba	319	Boar	29	8	
Sta. Cruz	252	do	31	18	
Do	214	Stallion	15		
Mindoro:					
San Jose	421	Boar	2		
Do	416	Bull	2		
Mindanao and Sulu:					
Do	153	Bull			
Do	414	do			
Do	A-8	Stallion			
Do	421	do			
Do	B-137	do			
Momungan	287	Boar			
Misamis:					
Mambajao	254	Boar			
Mountain Province:					
Benguet	441	Bull	20	4	
Do	436	do	30	6	
Do	B-102	Stallion	38	5	
Do	B-1	do	1		
Do	300	Bull	130	25	
Do	241	do	52	10	
Do	276	do	50	10	
Do	225	do	20	4	
Do	269	do	20	4	
Bontoc	358	Boar	2	5	
Do	359	do	2		
Nueva Ecija:					
Muñoz farm school	119	Stallion	34		
Do	3786	Bull	14	1	
Nueva Vizcaya:					
Bayombong	400	Bull			
Occidental Negros:					
La Carlota	118	Stallion	11		
Do	77	do	65	2	
Do	276	Boar	7		
Do	237	do	1		
Do	236	do	1		
Oriental Negros:					
Dumaguete	254	Boar	3		
Baiz	420	Bull	40	6	
Guihulngan	260	Boar	6		
Zamboanguita	252	do	5		
Dumaguete	442	Stallion	56	27	
Do	884	do			
Larena	122	do	26	10	
Do	185	do	28	16	
Do	427	Billy	12	8	
Pampanga:					
Mexico	422	Boar			
San Fernando	384	do	54	5	
Pandacan quarantine station	412	do	25		
Do	441	do	4		
Do	329	do	8		
Do	429	Stallion	4		
Do	530	do	3		

Location.	Property number of sire.	Kind of sire.	Number of services.	Number of off-spring.	Remarks.
Pangasinan:					
Rosales	248	Boar			
Do	249	do			
Villasis	331	do			
San Carlos	310	do			
San Fabian	442	do			
Umingan	443	do			
Rizal:					
Alabang stock farm	516	Stallion	12		
Do	95	Boar	1		
Do	356	do	21		
Do	334	do	13		
Do	Lit. 250	do	2		
Do	Lit. 222	do	3		
Do	Lit. 255	do	2		
Samar:					
Catbalogan	403	Boar			
Calbayog	404	do			
Catarman	405	do			
Sorsogon:					
Masbate	5784	Bull			Sold.
Do	3785	do			
Union:					
San Fernando	436	Stallion	107		
Bangar	274	Boar	13		
Naguilian	314	do	16		
Bauang	315	do	20	1	
San Fernando	316	Boar			
Bacnotan	317	do	13	2	
Zambales:					
Iba	123	Boar			Dead.

Alabang stock farm.—The activities of this farm have been practically the same as in previous years but the farm has progressed very slowly, principally, on account of the reduction of laborers, there being fewer laborers this year than in the past years.

The cattle fences have been in repair the entire year. As the bamboo posts decay they were replaced with new bamboo posts as concrete posts were not available. On three occasions during the third quarter the floods carried away several parts of the fences and this caused a great deal of inconvenience.

For the most part, the general routine was to keep grounds and sides of the roads clean, the trees pruned, and the irrigating ditches kept in proper condition. Portable colony houses, drinking and feed boxes, pig and chicken crates were built. The necessary repairs were made to farm buildings, carts, brooders, incubators, farm implements, machinery and water pipes. The old Spanish bridge was rebuilt during March to facilitate the work in the farm and inspection. A concrete muffler had to be built for the 50 horse-power oil engine as the one made of brick was not strong enough to withstand the pressure of the exhaust from the engine.

The pumping of the necessary irrigation water, the grinding

of corn and mungo for the mixed feed and the cutting of forage cane for the cattle and pigs has been all the work in which the engines were engaged this year.

Trinidad stock farm.—Mr. Bert Duckworth, acting superintendent of the Trinidad stock farm is the only salaried employee in this project.

The superintendent visits the nearby townships to encourage the natives to breed their animals to the Bureau stallions at the stations. Only five mares were bred to the stallion during the year.

A number of animals were treated for various ailments free of charge. There were also some horses and cattle castrated during the period.

The work has been carried mostly on the reconstruction of the cattle corrals and the building of driveways leading thereto, on fence repair and the changing of wooden posts to cement posts. Range burning received also considerable portion of the time of the station's force which consists in the average of six laborers and one capataz.

A very lamentable accident happened to the superintendent of this station near the end of the third quarter in which he suffered severe injuries in the legs due to a fall from the Bureau rig while on official duty. This necessitated the sending of one of the central office force as we were already short of field men.

At many times during this year there were plans by some Government officials, not of this Bureau, to transfer this station to some other branch of the Government. It is sincerely believed that such would be very unwise as the retention of this station by the Bureau of Agriculture is very necessary and important for the well-being of the Mountain Province, its vicinity and the country as a whole.

HORSE PROJECT.

Alabang.—The horse project at this station is not important. There are only 2 native mares, one American-Australian stallion, 6 geldings and two colts. All the horses were in good condition at the end of the year.

La Carlota.—In spite of due care and attention which were given our horses, the dreadful disease of surra again appeared at this station after its occurrence in 1915. Our Arab stallion, property No. 118, died of the disease. The other horses were found upon blood examination to be entirely free from the animal parasite *Trypanosoma evansi*, the specific cause of surra.

If it is possible, a new Arabian stallion will be sent over to take the place of the one which died.

The horses at this station have received an average daily ration of about six pounds of palay or corn per head, in addition to the green forage they could eat. Two horses died during the year and one male colt was dropped on September 12, 1917.

CATTLE PROJECT.

Alabang.—The cattle were in fair condition throughout the year. Of the cattle received during the second quarter, the Multani were put in the old Indian pasture and the Nellore in the large pastures with the others. Many of them were received with sores and bruises and were treated daily until recovery. The young bulls and steers were kept in the pasture near the old laboratory building and have remained in good condition throughout the year.

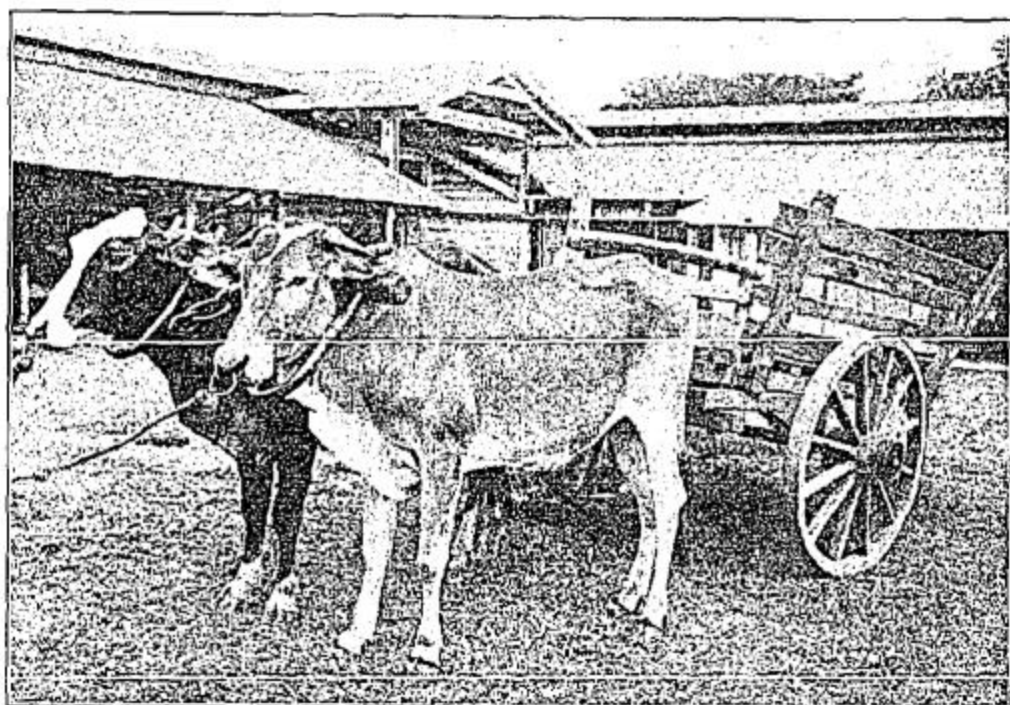
Owing to the heavy rains during July the young cows with their calves had to be caught and placed in a shed with cement floor to protect them from the severe weather. As a result there occurred accidents with two cows which were lamed very badly from slipping on the floor and they died on account of said injury. The milch carabaos which arrived at this station on June 17 are in fair condition. Sixty one calves, 30 male and 31 female, were dropped and 7 died during the year.

La Carlota.—On account of the abundant rainfall during the months of May and June, the grass in our Indian cattle pasture has grown quite luxuriantly, there being always green feed for the cattle. The small shrubs which grew all over the field were dug out from time to time, in order to give the edible grasses a better chance to grow. The animals are daily inspected in the pasture, and salt is given them twice a week. Nearly all the herd is at present in fine condition.

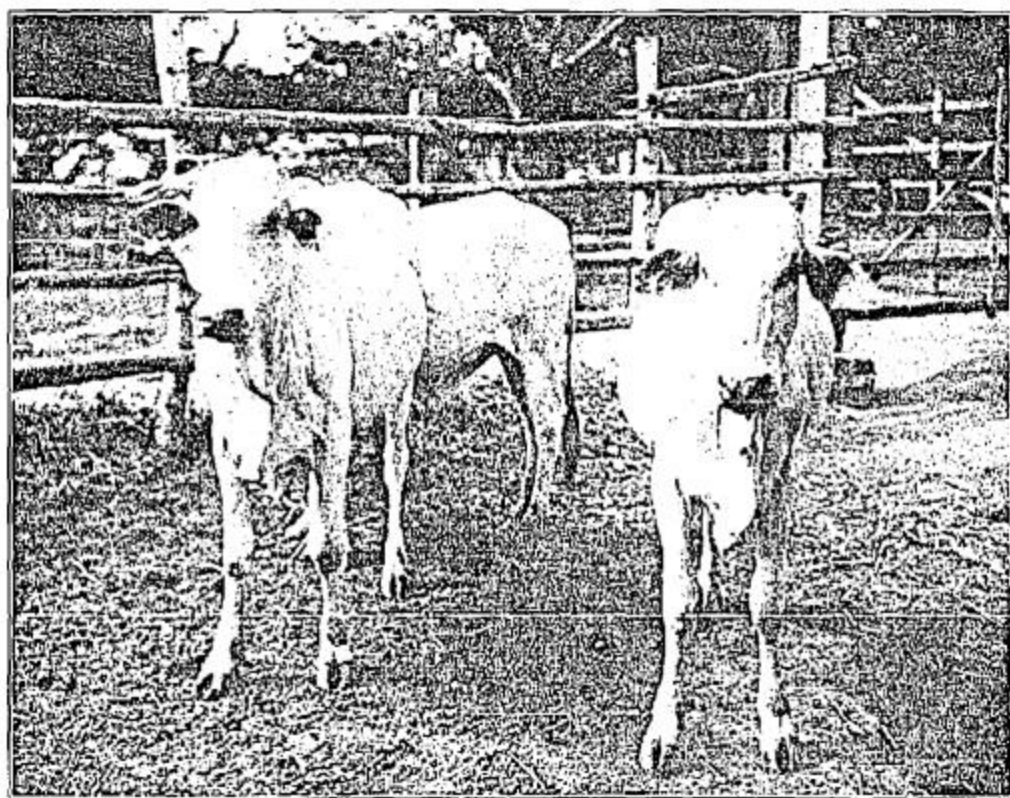
Among the Chinese cattle at the beginning of this year there were 4 cows and 10 bullocks, eight of the latter being Indo-Chinese. Two of the cows and one of the Indo-Chinese bullocks were sold at auction on account of old age.

The grade cattle have been pastured daily on the open land and given salt twice a week as usual. As there was abundant grass in the pasture even during the entire dry season, the good condition of the animals has been maintained.

Trinidad.—The cattle at this station remained in good condition during the year. They were all free from the usual insect pests.



(a) Products of Alabang—Four-year-old Grade or Mestizo work bullocks.



(b) Products of Alabang—Pure-bred Indian (Nellore) bulls. Two years old.

SWINE PROJECT.

Alabang.—During the first semester the swine made a good showing. The brood sows produced normally and their litters were of the average in number. However, the majority of the suckling pigs died during the second semester, supposed to be due to the old age of their sires and dams, especially of those imported from the States. To increase the vitality of their future offspring the old boar property No. 93 was replaced with boar property No. 356. All boars, sows and weaned pigs are in perfect condition.

It is intended to utilize for the growing pigs next year all available space to give them a larger area in which to pasture and to allow them more exercise. The reason for this is that the yards will be better supplied with green grass and there will be the advantage of less danger from infection with kidney worms. The empty lots can then be plowed and later planted to sorghum, peanuts or some other legume or plant that is desirable for hogs.

The average number of pigs per litter is seven pigs and the production of males and females has been about even. Four hundred sixteen were dropped and one hundred ninety died during the year.

Trinidad.—On April 10, 1917, six (1 male and 5 female) Berkshire pigs were sent to this station. One female pig out of this shipment died on May 19, 1917. Thirteen (7 male and 6 female) were dropped and six (1 male and 5 female) died during the year.

La Carlota.—At present we have two breeds of swine at this station, consisting of Berkshires and Duroc-Jersey. These animals are being fed twice daily with rice, corn, sweet potatoes, and allowed to run on pastures of guinea grass, peanuts and sweet potatoes.

Some of the animals which had been suffering from paralysis in the past have been cured. At present we have a couple of animals which are still affected with the same trouble, but these too are showing some improvement as they are being given small doses of nux vomica internally, in addition to the external treatment of camphor or soap liniment applied occasionally on their afflicted parts.

GOAT PROJECT.

Alabang.—The goats at this station have reproduced normally and are at present in good condition. Although only few re-

quests have been received during the year when compared with other livestock, still we are unable to supply the demand owing to the small number of goats in the herd. Thirty two kids were dropped and three died during the year.

La Carlota.—The goats at this station are doing fair but the raising of goats, according to advices, does not appeal to the people in this neighborhood. It is desired to transfer these goats to Alabang as soon as the foot-rot disease is found to be completely eradicated. Twenty-five kids were dropped and three died during the year.

SHEEP PROJECT.

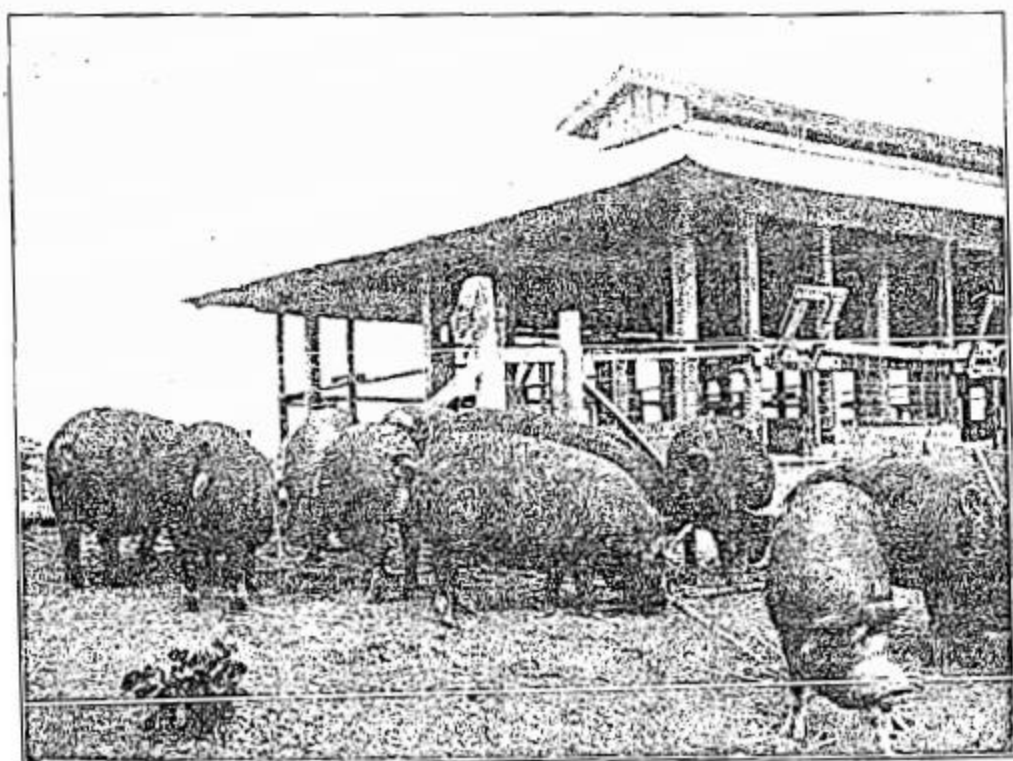
La Carlota.—Many of the animals that were affected with foot-rot in the past rainy season were cured. Much attention is being given to this trouble to prevent any further losses. The sheep are now in fair condition and are gradually increasing, notwithstanding the effect the foot-rot had on them during the past years. Nineteen were dropped and one died during the year.

POULTRY PROJECT.

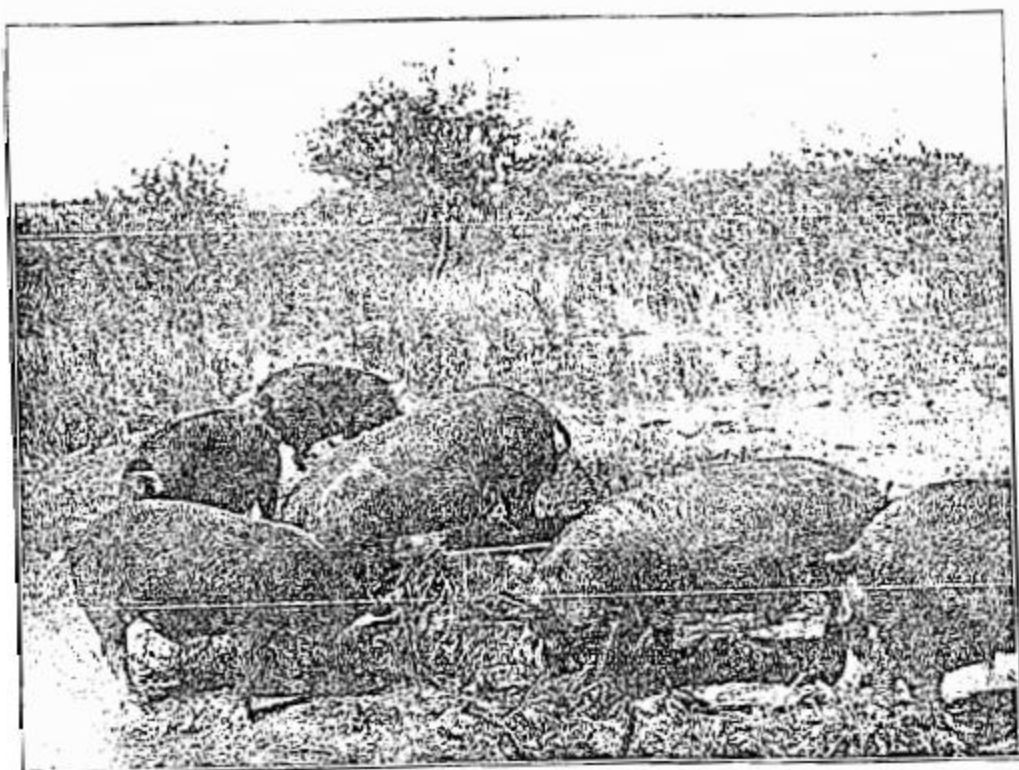
At the beginning of the year this project comprised the raising of chickens at Alabang, La Carlota, and Trinidad but the work was extended near the end of the third quarter to Cebu and Batangas. The results obtained, with the exception of Alabang, were satisfactory but it is believed that there is still room for improvement. In round numbers the poultry at Alabang increased 20 per cent, at Trinidad 160 per cent and at La Carlota 560 per cent.

Alabang.—At Alabang the hens laid well with an average of 92 per cent of fertile eggs. The feeding of animal matter had a decided influence in the increase of the fertility and production of eggs and this can be easily explained by comparing the analysis of an egg with that of the substance fed. On the other hand, recent experiments carried in the States have shown that animal protein is more easily assimilated by poultry than vegetable protein and this is responsible for at least the increase in production of eggs. However, there is the danger of over-feeding animal matter which should be avoided as the poor results at Alabang in raising chickens is supposed to be partly due to over-feeding of animal matter.

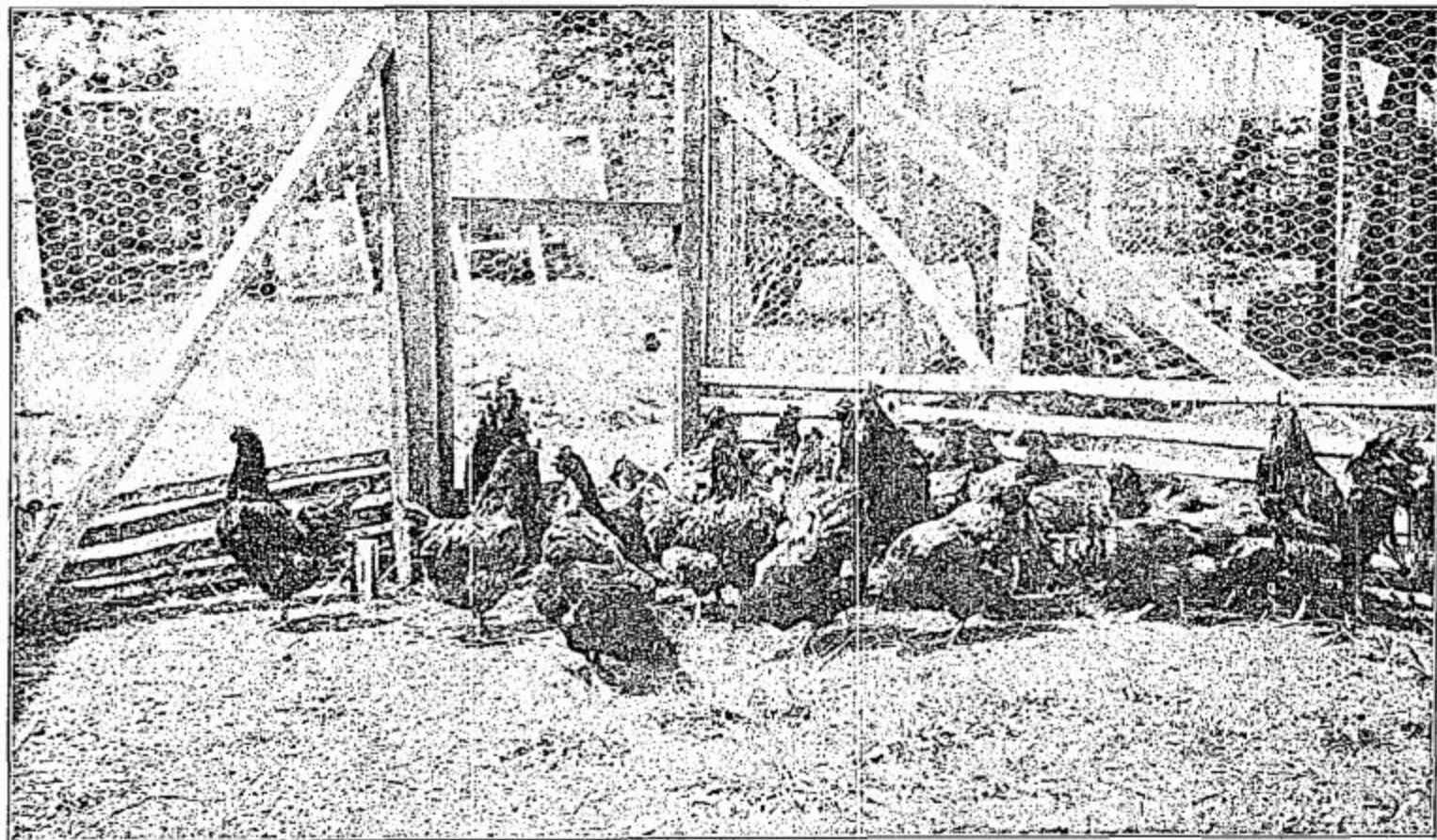
The incubators with the exception of the Petaluma have given satisfactory hatches. The bad results obtained from the latter were very likely due to improper management. For the reason



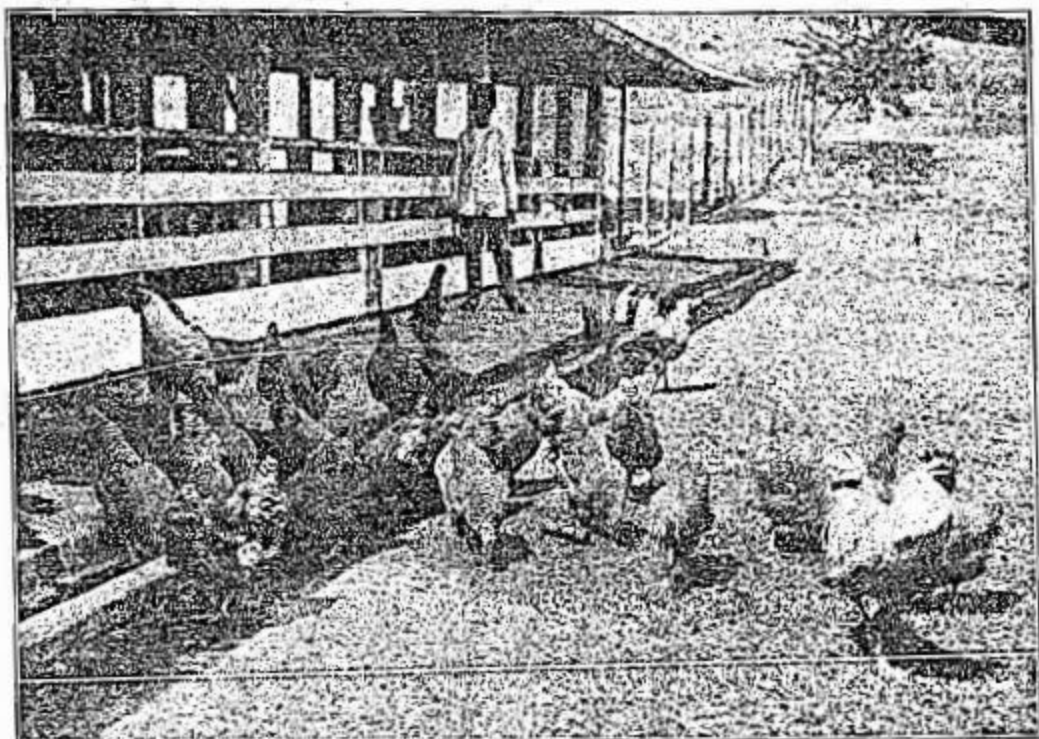
(a) Products of Alabang—Young Berkshire sows.



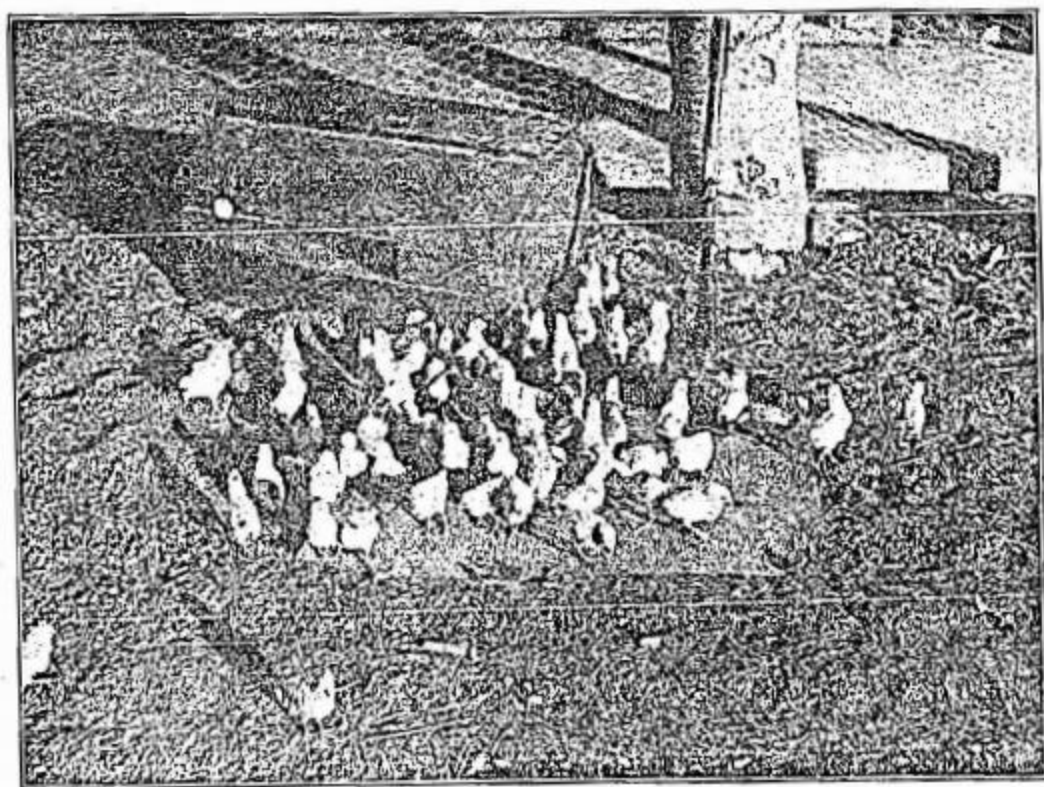
(b) Products of Alabang—Young Berkshire boars.



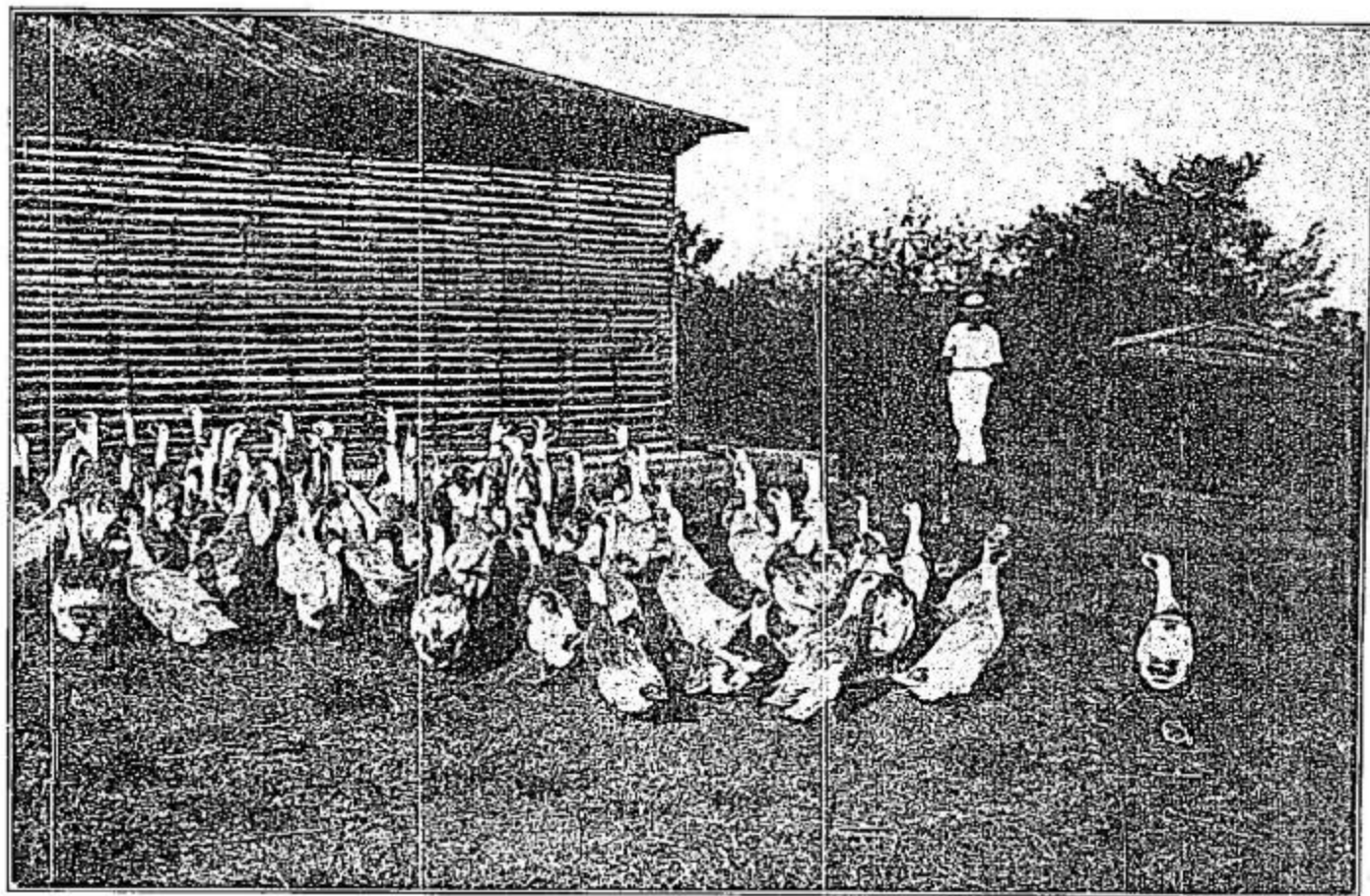
Products of Alabang—Rhode Island Red chickens.



(a) Products of Alabang—Barred Plymouth Rock chickens.



(b) Products of Alabang—Artificial incubated chickens in artificial brooders.



Products of Alabang—Indian Runner ducks.

that the hot water incubators gave better results than the hot air incubators it was deemed proper to increase the number of hot water incubators.

According to reports, very poor results were obtained from the fireless brooders and their use was entirely stopped this year. Proper management is believed will give the desired results and it has been decided to give them another trial next year. Slightly better results were given by the hot water brooders, but they can not be classed with the mother hen, the chick of which made a good growth in the second quarter considering the bad weather which then prevailed.

The mortality of chicks and adult chickens increased materially the second semester and the cause of it was attributed mostly to chicken pox and roup.

The regular moulting season seems to begin during the end of July with the Cantonese and August with the American birds. This was very noticeable as the good production of eggs begins to decrease during that time. The fertility of eggs was also slightly affected during this period.

The Indian Runner Ducks which arrived last April have done wonderfully well, considering the conditions to which they were subjected while en route from California to Manila. They begun to lay three days after their arrival and the change of climate has not altered their good name as good layers.

This duck, as its name implies, originated in India. From there it was taken to England and later to the United States in which countries the strain was improved to its present state. This duck is noted for its laying qualities and it is expected that it will, in years to come, be popular as a table duck. The drake weighs about 4½ pounds and the duck a trifle less. They are fawn, gray or white in color but the former is the most popular variety and is what the Bureau has at Alabang. They are non-sitters, very much like the "Taguigs" ducks in conformation, very hardy, first-class foragers and are quite domesticated. To produce fertile eggs it is claimed that it is necessary to supply the bird with swimming water and we might add that the water should be kept as fresh and clean as possible.

This year the sales of eggs amounted to P1,981.19. There was an increase of about 10 per cent in the average production of eggs per individual hen.

La Carlota.—The results obtained from poultry at this station have been very satisfactory and beyond expectations. However, as a center for the distribution of poultry, it has not met the

approval of many officials for the reason that it is not centrally located.

Trap nests are being used for the hens, so that we have a complete record of the number of eggs laid by each individual hen of each breed at this station.

Our grown chickens are being given a grain ration of palay and corn, and in addition, fish and shells are also given from time to time; the young chicks are fed on a ration of part hard boiled eggs, milk, and ground corn or rice middlings.

Trinidad.—The Black Minorca chicken has been found to be more delicate than the White Leghorn. At both La Carlota and Alabang, the results were very unsatisfactory, when compared with those at this station and the adaptation of this chicken in this country will have to be presumably done by first introducing them in this region where it seems to be better adapted than in regions of a lower level, and then gradually distribute them to other provinces. The only logical reason for this adaptation is the climate, which is cool.

VETERINARY DIVISION.

PERSONNEL.

On December 31, 1916, there were on the rolls 18 veterinarians (of whom 8 were Filipinos and 10 Americans), 24 American livestock inspectors (including 5 without salary), 375 Filipino livestock inspectors, 1 American clerk, 2 Filipino clerks and 1 American foreman.

On December 31, 1917, the force consisted of 24 veterinarians (of whom 15 were Filipinos and 9 Americans), 15 American livestock inspectors (including 6 without salary), 346 Filipino inspectors, 1 American clerk and 3 Filipino clerks. This constitutes an increase of 7 Filipino veterinarians and 1 Filipino clerk and a decrease of 1 American veterinarian, 9 American livestock inspectors, 29 Filipino inspectors and 1 foreman (American).

ADMINISTRATION.

Importation from foreign ports.—During the year a very few cattle were received from Spain and Australia for dairy or breeding purposes and nearly 500 cattle of Indian breed were admitted via Singapore.

Small numbers of cattle and carabaos were imported for slaughter or work purposes from Pnom-penh, Saigon, Hongkong and Singapore.

Interisland shipments.—During the year 20,194 cattle and

3,007 carabaos arrived at Manila from interisland ports. This is an increase of over 5,000 cattle from the 1916 figures which in turn were far above those of any previous year.

Inspections for which fees were charged.—During the year 142,545 animals of all kinds were inspected on arrival at the city of Manila, for which fees amounting to ₱18,658.20 were charged and collected. Of these animals 110,760 were swine.

Postmortem inspections in Manila matadero.—There were 125,716 animals of all kinds inspected at the Manila matadero during the year, 1,400 being condemned, and 124,307 passed for food.

COMBATING OF ANIMAL DISEASES.

Rinderpest.—The severe outbreak of this disease, which assumed such serious extension in 1916, continued with unabated virulence throughout the current year. The recorded number of cases and deaths, 33,971 and 26,951 respectively, are in fact considerably in excess of the 23,808 cases and 18,251 deaths reported in 1916. As was stated in the last preceding annual report, these figures represent only such cases and deaths as were discovered by members of the veterinary force or voluntarily reported by owners or local officials. This being the case, the apparent increase of rinderpest cases and deaths in 1917 may perhaps be due to more complete returns rather than to an increase in the actual losses.

It was apparent from the beginning of the year that the appropriation for the veterinary division was entirely insufficient to even enable us to carry the force through the year, to say nothing of the increases that might become necessary from time to time to control new outbreaks. On May 11, 1917, the Emergency Board made an allotment of ₱250,000 in addition to the ₱140,000 appropriated by Act No. 2672 for the rinderpest campaign. This has enabled us to continue in the service the personnel on hand at the beginning of the year and to make such increase from time to time as the situation required.

The following table shows the incidence of rinderpest cases and deaths during 1917 by three month periods:

Rinderpest cases and deaths by quarters.

	New cases.	Deaths.
First quarter.....	6,245	6,325
Second quarter.....	9,376	7,762
Third quarter.....	9,198	7,573
Fourth quarter.....	7,152	6,291
Total.....	31,971	26,951

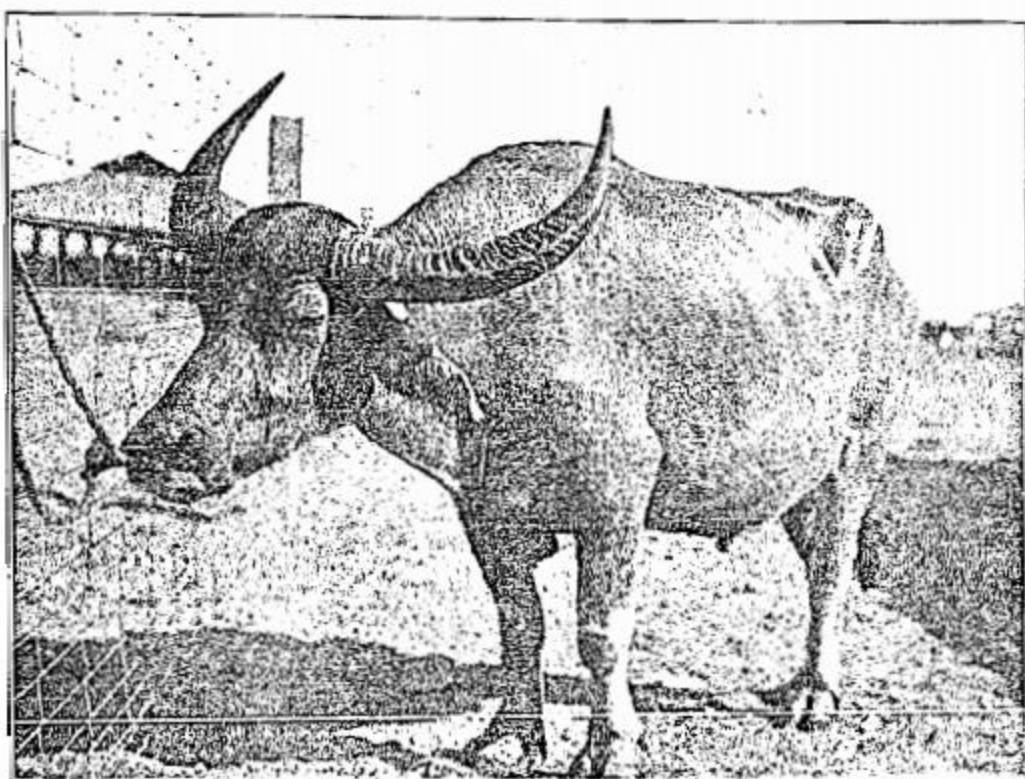
Our records show that during the year 448 new outbreaks occurred, counting each municipality declared infected or reinfected during the year as a separate outbreak. This number compares unfavorably with the 319 towns which became infected during 1916.

The year opened 18 provinces and 87 municipalities infected; and ended with 23 provinces and 115 municipalities infected. The total number of provinces infected during the year was 30, or 7 more than during 1916.

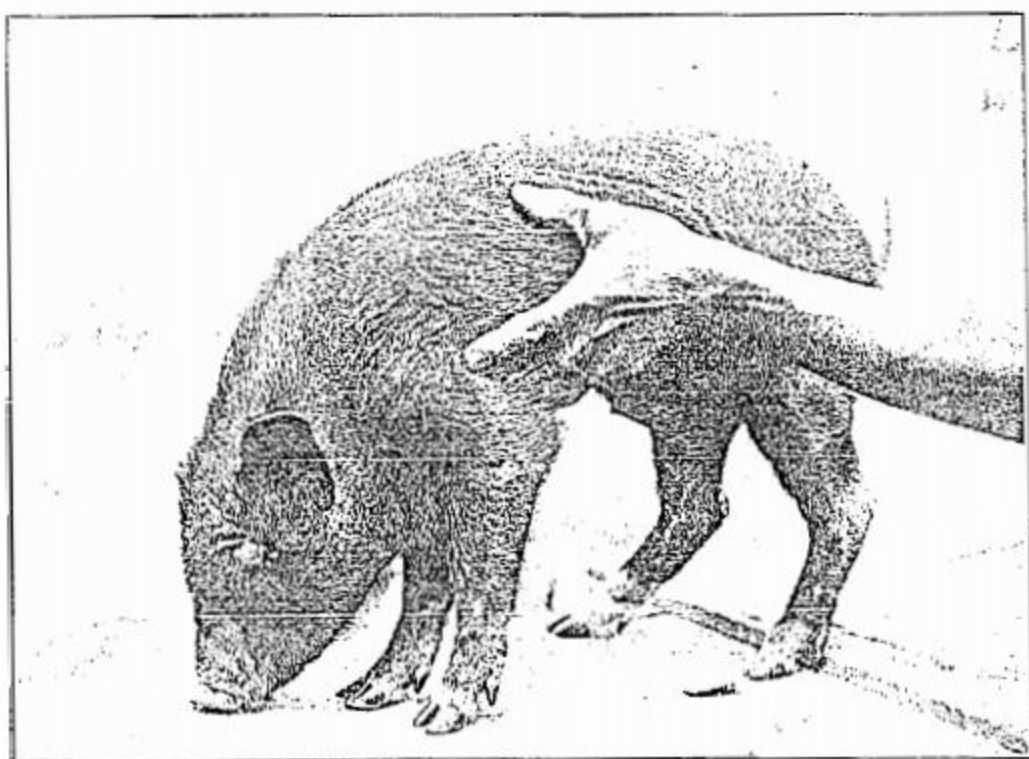
These provinces that became newly infected during the year accounted for 14,466 of the new cases and 11,585 of the deaths. Some of these provinces such as Mindoro, Department of Mindanao and Sulu, Leyte, Sorsogon, and Samar had not been infected with rinderpest for several years. During those free years there had been born thousands of animals which were more or less highly susceptible and which would naturally more readily fall prey to the disease than the older animals which had acquired more or less immunity during previous attacks. Other provinces such as Laguna, Oriental Negros and Nueva Vizcaya had had rinderpest during more recent years but in a comparatively mild form and therefore had many susceptible animals that would quickly fall victims to an outbreak as virulent as that of the past year.

It has not always been possible to trace the source of these new infections. This can be readily understood when one takes into consideration the fact that not only carabaos and cattle, but also swine, sheep and goats are susceptible to rinderpest and that these latter animals often have the disease in a mild, obscure form. In the southern islands communication between the various islands is by means of small sailing vessels, which frequently have a few pigs or goats aboard. As they can land at any place along the coasts it can be seen that they might scatter the infection in a manner which would be almost impossible to trace.

The Department of Mindanao and Sulu has been entirely freed from rinderpest. The veterinarian of the Bureau of Agriculture detailed there was given a free hand by the local authorities and received not only their fullest cooperation but also that of the Constabulary which was detailed to assist him. As a result the province was completely cleaned in a few months time. At the present writing it appears that the disease is gradually being brought under control in the other newly infected provinces and also those that were infected at the beginning of the year. The



(a) Carabao sick with rinderpest. Pandacan Quarantine Station, Pandacan, Manila.



(b) Pig sick with rinderpest at Pandacan Station, Manila.

prospects are therefore brighter of making a considerable reduction of the area infected and also of the cases and deaths during the coming year.

During the past year two serum laboratories operated by private individuals were established. The serum produced by these laboratories has been under the supervision and inspection of this office, all bottles having been stamped with the mark of this Bureau before being removed from either laboratory and put on the market for sale. We have produced but a very limited quantity of serum ourselves during the past year. One reason for this was the presence of foot-and-mouth disease at Pandacan, for several months, which rendered the production of serum at that place impracticable owing to the danger of spreading this disease throughout the provinces by means of contaminated serum.

Another reason was the fact that both of the private serum producers had access to a large number of cattle suitable for the production of serum at a much smaller cost than the same could be obtained by this Bureau. It was therefore found that the limited quantity we could produce would be but very little cheaper than the serum obtained from the producers. During the past year considerable quantities of antirinderpest serum have been used in the various infected provinces; Bulacan, Rizal, Laguna, Cavite, and Pangasinan having been the largest consumers. The most insistent demand came from those provinces and municipalities which had recently become infected and where the disease was causing a heavy mortality. These were the places where the greatest results were expected from serum and where in reality the least satisfactory ones were obtained. This can be accounted for by the fact that as there had been no severe outbreaks of rinderpest in many of these places for several years a considerable number of susceptible animals had been produced in the meantime; also the disease during the present outbreak was of a very virulent type. Also, another factor was that after the animals had been injected with serum there was a tendency toward laxness as far as quarantines and isolation were concerned. The majority of people unfortunately expected too much from the serum; many were of the opinion that the immunity conferred would last as long as a year and in nearly all places the opinion was prevalent that serum conferred an immunity lasting from two to six months. As a matter of fact experience has shown that serum cannot be depended upon to confer an immunity for a much longer period.

than 10 days. Antirinderpest serum when injected into an animal produces no reaction and its action is maintained only up to time that the antibodies have been eliminated by the natural body processes, after which the animal is again susceptible to infection. In many individuals this elimination is very rapid as we have records of many animals which came down with rinderpest within a week after the injection of serum. Many authorities claim that antirinderpest serum does not prevent infection with rinderpest. Holmes, in India, has expressed the following opinion, "It appears to me that the infection can be taken into the system immediately after the serum injection, and that it produces its reaction at the time when the immunity is decreasing." Stockman, in the Transvaal, came to the following conclusions "That serum alone cannot be depended upon to give absolute immunity for a much longer period than 10 days, therefore the injections must be repeated three times with that interval to protect an animal for a month (the outside limit of infection). To ensure success, the serum must be injected to all the cattle likely to come in contact with the infected; it will, of course, save serum if the infected herd can be properly isolated from its neighbors." In the report of the proceedings of the Eighth International Veterinary Congress the following statement is made in regard to Professor Arloing's experience in Egypt. "Professor Arloing could not acquire in Egypt, a conviction upon the practical value of serum. Certain results seem to indicate that this serum but prolongs the incubation period; in other cases it prolongs the duration of the infection. In a large estate there were 45 deaths after 4 injections of serum."

Ward in his "Experiments on the Efficiency of Antirinderpest Serum" states, "That antirinderpest serum does not prevent infection with rinderpest. On the contrary, animals infected with serum and exposed to rinderpest soon contract the disease and pass through a more or less modified attack." Our experiences coincide with that of the authorities quoted above. Therefore it is well not to expect astounding results from the use of serum, and especially so when administered in districts where the rinderpest is of a high virulence. The method employed in India of mixing the animals which have been given serum with the sick ones to induce a mild infection could not be generally employed in the Philippine Islands. The reason is that the cattle and carabaos of this country are more highly susceptible than those of India and therefore disastrous results might follow this procedure. It is possible that fairly

good results might be obtained with this method in the Ilocos provinces where the *present* rinderpest infection is very mild, but it would be out of the question to attempt it in places where we have rinderpest of a greater virulence.

At the request of the First Assistant Director of Agriculture the sum of ₱50,000 out of the ₱250,000 allotted by the Emergency Board was set aside for the purchase of serum and the sale or distribution of this in such manner as the Bureau of Agriculture might deem advisable. Serum to the amount of ₱5,990.88 has been distributed free of charge. Of this amount ₱1,297.90 is for serum injection free of charge to sick animals to test the efficiency of the serum as a cure; the remainder was injected free of charge among the animals of people who claim that they were too poor to afford the cost of the serum. In this connection it might be stated that the testing of the efficiency of serum as a cure coincided with the results previously obtained by several workers, namely that serum has no curative value for infected animals. Considerable quantities of serum have been injected at half price and there are on hand at the end of the year 860 liters of serum in cold storage.

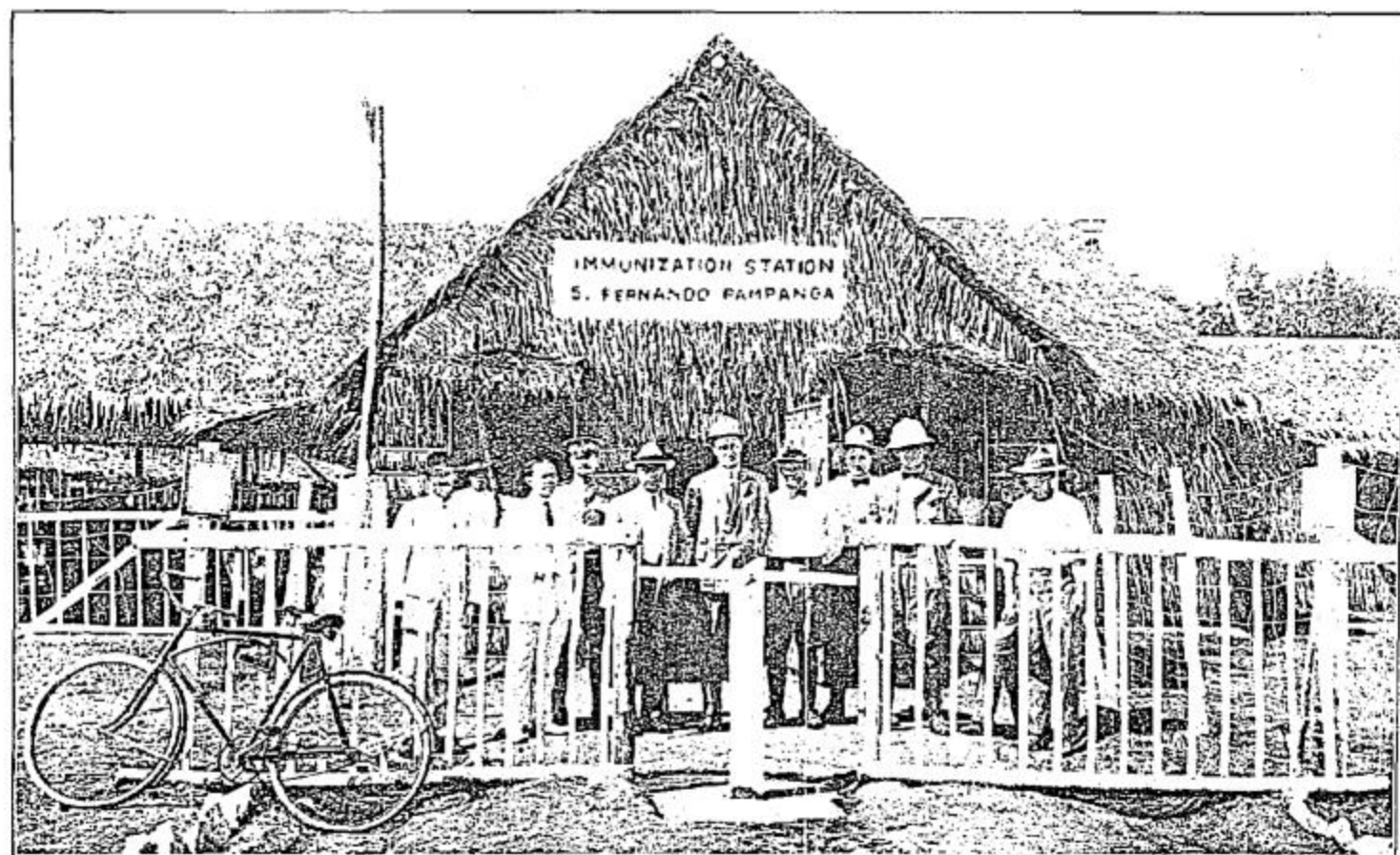
The chief veterinarian does not recommend the free distribution of serum nor its sale at half price for the reason that the results obtained from serum are not commensurate with the expenditures involved. The immunity conferred is too short to be of any real value in the eradication of the disease. On the whole it is safe to say that the people in the provinces who have had experience with antirinderpest serum do not now have the same faith in its efficacy which they possessed a year ago. As there are people who still have a great deal of faith in the value of serum and desire to use it as an additional protection to their animals they may be at liberty to do so and may themselves purchase the serum direct from the producers and thus relieve this Bureau of a great deal of unnecessary expense and trouble.

Immunization.—On March 9, 1917, the Philippine Legislature enacted Act No. 2679 appropriating the sum of ₱250,000 to carry out the provisions of Act No. 2548 "for the immunization of cattle and carabaos to prevent the spread of rinderpest in the Philippine Islands." The funds appropriated by this Act provided for the salaries and traveling expenses of the technical personnel, acquisition of instruments and medicines required, purchase of animals for virulent blood, and for aid to the "insurance fund" of provinces in which immunizing stations are established.

Most of the immunizing operations during the year were carried on in the Province of Pampanga. This was due to the fact that the immunization of cattle and carabaos was begun in that province in 1914 and had been steadily continued through the years 1915 and 1916. The stations were already established, the personnel trained, and the people accustomed to the work. The governor of this province has also taken a very active interest and devoted a great deal of his time to popularizing and extending the work of immunization. The immunizing stations at San Fernando (with a substation at Santa Rita) and Macabebe (with a substation at Apalit) were in operation at the beginning of the year. Work was commenced at Lubao in July and at Angeles in September. The San Fernando and Macabebe stations were temporarily closed in June as the people had to use their animals during the rice planting season; they were however, reopened in September. During the months of November and December none of the stations could be run at full capacity owing to the rice harvest and the beginning of the sugar milling season. The number of carabaos and cattle immunized in Pampanga during the year was 4,648, with a total mortality from all causes inside the station of 187 or 4 per cent.

At Iloilo the total number immunized was 1,280 of which 947 were carabaos imported from Indo-China and 333 native animals. The mortality, from all causes was 51, or a trifle less than 4 per cent. At the Pandacan quarantine station there were immunized 1,263 carabaos and cattle, 8 sheep and 2 goats. Only 300 of these were native animals the rest being carabaos imported from Cambodia and cattle from India and Hongkong. The total mortality among the carabaos and cattle was 36 or 2.8 per cent. None of the sheep or goats died.

The total number of animals immunized at different stations during the year was, therefore, 7,191 and the total number of deaths occurring from all causes from the time of entrance until the release of the animals was 274 or 3.8 per cent of the number admitted to the stations. Several deaths occurred from such causes as colic, tetanus, abortion, paralysis, and injuries accidentally received. But the most difficult problem was presented by the animals that were already in the period of incubation of rinderpest, though apparently normal at the time of arrival at the station, and one, two, or three days afterwards came down with the disease. It was possible to save but a small percentage of these animals. At the present time we know of no good practical way of absolutely eliminating this factor. As yet no



Immunization Station, San Fernando, Pampanga.



Carabao in dipping tank preparatory to release, Immunization Station, San Fernando, Pampanga.

test has been discovered which will show whether an apparently healthy animal is already infected with rinderpest. We have tried keeping the animals under observation for some days before submitting them to the simultaneous inoculation. The people do not like this very well, however, as they consider the three weeks period required for immunization a sufficiently heavy burden. Until some reliable test may be discovered it will therefore be necessary to rely on the skill and judgment of the veterinarians in charge of the various stations, always bearing in mind that cases of this kind are bound to occur in spite of their most careful and painstaking inspections.

Of the imported animals received during the year at the Iloilo and Pandacan stations nearly every shipment has on arrival been found to be infected with rinderpest. This accounted for the majority of the deaths in these shipments. Four different lots of cattle, totaling 195 head, imported from Hongkong were upon arrival found to be badly infected, as a result of which 30 head succumbed. Considering the fact that each lot had several animals that showed very typical symptoms of rinderpest on arrival, it is strange that no evidences of disease were noted at the time of embarkation as the steamer run between Hongkong and Manila is only about 60 hours. We have no control of the inspection at the ports of embarkation. The importers bear all the losses and it should therefore be part of their business to use all possible precautions to obtain clean shipments of animals. One shipment of cattle from India came down with foot-and-mouth disease three days after arrival; two different shipments of carabaos from Cambodge (Indo-China) were also found upon arrival to be infected with this disease. Animals become greatly debilitated from this disease, and it was therefore necessary to hold these shipments for several weeks before subjecting them to immunization against rinderpest. When such animals then do react to the inoculation they very frequently pass through a pretty severe course of the disease. These facts show that clean shipments of imported animals are the exception rather than the rule, and it has therefore not been possible to admit them to the "immunization insurance" provided by Act 2548.

During the past four years 30,131 carabaos and cattle have been immunized against rinderpest by the Bureau of Agriculture. These animals live in rinderpest infected districts, are not subjected to quarantine regulation and have had ample opportunity to contract the disease. To the best of our knowledge less than

1 per cent of these animals have subsequently contracted rinderpest. Owners of immunized animals are very quick to report any ailments with which they may suffer. Several times our veterinarians have been called upon the pretext of rinderpest and have found some minor ailment and frequently nothing noticeably wrong.

Experience seems to indicate that immunized suckling calves lose their immunity after a year or thereabouts. If true, this is not a very serious defect, as these animals can easily be returned for immunization at the end of this period and still not cause the owner much inconvenience as even then they would not be old enough to work. Further experiments are being conducted to test the immunity conferred upon suckling calves by simultaneous inoculation. These will be reported upon in detail when more definite conclusions have been arrived at.

Experiments are also being conducted to determine the duration of the immunity in animals which showed no reaction after the simultaneous inoculation. A detailed report will be made upon the conclusion of the experiments. It may be that they will justify a modification of the present methods of immunizing against rinderpest.

The rapid extension of the immunizing campaign has been greatly delayed by the shortage of our veterinary personnel. Owing to the severity of the rinderpest outbreak it was necessary to keep the majority of our force on quarantine work, and even then we were not able to supply more than about half the number of veterinarians that various provinces and municipalities requested be sent to assist them.

During the coming year it will be possible to make further extensions of the immunizing work; the decrease in the severity of the rinderpest infection in several provinces will release some veterinarians from quarantine work, and the graduation of the 1918 class from the Veterinary College of the University of the Philippines as well as the arrival of Filipino graduates from veterinary colleges in the United States will also help to release some of our older men for immunizing. At present two more veterinarians are in training for this work, who will be placed in charge of stations as soon as possible.

Governors of two of the provinces which had become newly infected, and where rinderpest was at the time running a severe course, personally came to Manila to request the immediate establishment of immunizing stations in their respective provinces, hoping by this means to rapidly check the disease. It was ex-

plained to them that immunization could not be counted on to produce any marked or rapid improvement in the situation unless a large station were established in every infected municipality and that this was absolutely out of the question owing to our lack of technical personnel. Furthermore, that even if the men and equipment were available for the immediate construction of several stations the prospects of obtaining very favorable results—viewed from the standpoint of the layman—were rather gloomy, owing to the fact that as the disease was present in a virulent form, dozens of animals already in the incubation period would be brought to the station, and a high mortality could in all probability not be avoided. The people seeing a high death-rate would naturally attribute this to the immunization, as it is rather difficult for the layman to comprehend the fact that an animal may be already infected with the organism of rinderpest though apparently in good health. The work of immunization would therefore stand a good chance of becoming discredited in those sections. It is also rather a slow process, about 200 animals per week being the maximum number that one veterinarian can properly care for. The disease would, therefore, have run its natural course in a badly infected locality before a large percentage of the animals could have been immunized. As has been repeatedly stated in previous reports the proper time to immunize is before the rinderpest assumes a virulent character.

Recommendations.—Immunization properly applied is the surest method for the control of rinderpest, and with judicious extension will be one of the prime factors in the eradication of this disease. Care must be taken, however, not to lead the public to believe that it will accomplish the miracle of bringing about the eradication of rinderpest in a short time and without the necessity of observing the fundamental principles of sanitation and hygiene. All the measures at our disposal must be properly and carefully applied in order to keep the disease well under control and thus give hope of ultimate success in its eradication.

Rinderpest is enzootic in many sections of the Islands and it will take time, perseverance, and patience to stamp the disease out in these centers. This means that the people will also have to learn that they will have to spend some money for the protection of their animals and not depend upon the Government to pay for everything. The people of America and Europe spend yearly for the protection and treatment of their animals many times what their respective governments expend for animal

disease control. When anything is wrong with the stock, a practicing veterinarian is called in just as a physician is called in to attend a sick member of the family. In this country even those people who can well afford it are disinclined to spend any money for the services of a professional man to treat their animals. Such things as the free distribution of serum do not tend to remedy this matter.

If the Government fosters the continuation of this spirit the outlook for the veterinary profession in this country is not very bright. The Government is now urging young men to study veterinary medicine, principally by calling attention to the lucrative opportunities that are waiting for the members of this profession. As a result the matriculation in the College of Veterinary Science has increased several hundred percent and there are also several Filipino students at Veterinary Colleges in the United States. It is undoubtedly true that for the next four or five years the Government will be able to give these graduates employment, but after that time it is unlikely that it can continue to provide for all the men that will graduate in succeeding years. Consequently, if the opportunities for private practice do not increase greatly within the next few years the time will come when veterinarians will find themselves unable to make a livelihood in their chosen profession. In order to gradually accustom the owners of animals to seek professional services for their livestock, it is, therefore, recommended that veterinarians of the Bureau of Agriculture be allowed to engage in private practice with the proviso, of course, that it must not interfere with their official duties. It is our opinion that livestock owners will thus come to realize that the sums spent for professional services is money well invested. Hundreds of animals die each year from common ailments which could be saved if the people became accustomed to seek veterinary assistance.

Foot-and-mouth disease.—On March 2, 1917, a shipment of 354 Indian cattle, 8 sheep, and 2 goats arrived in Manila from Singapore. These animals had been purchased in India and sent to Singapore in small lots and were held at that place until the total number had arrived and a steamer chartered to convey them to Manila. Some of these cattle had been in Singapore for 3 months. They were embarked February 25th and were five days en route to Manila. Inspection on board ship upon arrival revealed no sign of disease. They were, however, taken to the Pandacan quarantine station for detention and observation prior to immunization against rinderpest. On

March 5th some of the animals presented clinical evidence of foot-and-mouth disease and within 18 days the entire herd was infected, and the majority passed through a severe attack of the disease. It is evident that the shipment had become infected immediately prior to embarkation at Singapore as the disease did not become clearly evident until 8 days after that time. It was not feasible to order the slaughter of these cattle as they were valuable animals imported for breeding purposes; they were, however, put into the strictest isolation and all possible precautions taken to prevent the escape of the infection from the quarantine station. But as was feared from the beginning this proved to be an impossible task. There were at the time over, 1,000 head of cattle within the quarantine station, beside the shipment in question there being about 600 Indo-Chinese cattle and 100 native cattle on hand. Within two weeks after the appearance of the foot-and-mouth disease practically all the animals in the station were infected. Feed had to be brought for all the animals and left near the limits of the station and it was therefore impossible to keep the place absolutely isolated. In some manner the infection did escape as the disease was discovered in some carabaos in the city of Manila the first week in April. The virus had become greatly attenuated, however, as the disease in Manila did not run a severe course and among carabaos was especially mild. Neither did it spread any further than to the adjoining towns of Rizal Province. Infected and exposed animals were carefully isolated and regular and careful inspections carried on in the infected and suspected areas. By the middle of September the disease in Manila and vicinity had been brought under control.

In some inexplicable manner the foot-and-mouth disease was carried to San Jose, Mindoro, making its appearance there the first part of September. It has been confined to San Jose and immediate vicinity and according to the reports received from our veterinarians had practically been brought under control by the end of the year. No other provinces became infected during the year.

Two shipments of carabaos from Saigon also arrived infected with foot-and-mouth disease; one shipment of 68 head on October 23, 1917, and another of 71 head on November 11, 1917. As these shipments were small they were more easily handled

and placed in strict isolation, and therefore did not cause any further spread of the infection.

Contagious pleuro-pneumonia.—No cases of this disease have

been reported during the year. The quarantine notice issued some years ago by the Honorable, the Secretary of Public Instruction, placing the barrio of Sisiman in quarantine to prevent the possibility of this infection being spread from Australian animals imported for slaughter to other points in the Philippine Islands, is still in effect.

Surra.—No special campaign against this disease has been undertaken during the year owing to the heavy demands made by the rinderpest campaign upon the personnel of the division and the absence of any known preventive or curative for this disease. Surra is known to be widely disseminated in the Islands and numerous reports of the loss of animals from this cause have reached this office.

Glanders.—Cases of glanders among horses have been found from time to time during the year in the city of Manila and ordered destroyed. As this disease is readily communicated to man, and with invariably fatal consequence a vigorous campaign for its eradication from the city should be undertaken. This of course demands adequate personnel. In this connection, it should be noted that no cure for glanders is known and the destruction of the infected horses, frequently bitterly opposed by the owners, is the only practicable course.

Hog cholera.—This disease is known to exist in all the swine raising regions of the Archipelago and undoubtedly causes serious losses each year. No reliable statistics have been obtained as to the number of cases and deaths. The custom of allowing hogs to run at large and forage for themselves is the very thing that keeps the disease continually alive and, as with rinderpest, greatly increases the difficulties of bringing it under control.

Owing to the large outlay of money that would be required and the present heavy demands upon the personnel of the Division the undersigned does not recommend the manufacture of anti-hog-cholera serum at the present time.

Anthrax.—Cases of this disease have occurred during the year in northern Mindanao and around the shores of Laguna de Bay, but the known losses have not been sufficiently serious to warrant withdrawing men from the rinderpest campaign to combat them.

Hemorrhagic septicaemia.—No cases of this disease have been brought to our knowledge during the year, which is not surprising as the regions where this disease is most liable to cause trouble have been relatively free from rinderpest and hence less closely under our observation.

LIVESTOCK IMPORTATIONS.

The year witnessed a further decline in the importation of live animals from foreign ports, due rather to the scarcity of tonnage and excessive freight rates than to any lack of demand in the local market. The shortage of imported animals for slaughter and of the importation of chilled and frozen meat, as well, accounts for the marked increase, noted elsewhere, of native cattle and swine shipped to Manila for slaughter.

During 1917 of the 4,618 cattle arriving at Manila from foreign ports 3,812 were from Pnom-penh, 497 from Singapore, 195 from Hongkong, 100 from Saigon, 11 from Australia and 3 from Spain. During the year 185 carabaos arrived from Pnom-Penh, 57 from Singapore and 71 from Saigon. No changes were made during the year in the General Orders regulating the importation of animals.

ILOILO QUARANTINE STATION.

Three lines of work were conducted at this station during the year: Quarantine and immunization of work animals arriving from French Indo-China, immunization of local animals, and the slaughter of Indo-Chinese cattle for local consumption. During the year 220 cattle and 498 carabaos arrived from Pnom-Penh. During the first quarter of the year 104 cattle were slaughtered for food.

SISIMAN MATADERO.

This station, which is used exclusively for the slaughter of Australian cattle, was closed throughout the year owing to the suspension of importations from that country. Mr. G. J. Wilson has been stationed there during the entire period to care for the Bureau property at the station.

SAN LAZARO IMMUNIZING STATION.

This station has been loaned to and used by the College of Veterinary Science, University of the Philippines, during the entire year.

VETERINARY RESEARCH LABORATORY.

Mention was made in the Annual Report for 1916 of a new pneumonia discovered in swine. During the past year additional work has been done with this disease. It has been found that its causative agent is a "pseudomonas." The symptoms are quite similar to the chronic form of swine plague and the lesions are also very similar to this disease. The organism is easily cul-

tivated on artificial media; and is also pathogenic to rabbits and Guinea pigs, causing a severe septicaemia when injected subcutaneously, the animals succumbing in from two to three days. A method for immunizing against this disease is being worked out and so far favorable results have been obtained. A detailed report will be made when more conclusive results have been obtained.

A disease in cattle in the Philippine Islands similar to *Anaplasma marginale* has been found and a full report published in the Philippine Agricultural Review, Vol. X, second quarter, 1917. This disease does not appear to be the cause of any considerable loss among cattle in the field.

In the Philippine Agricultural Review, Vol. X, third quarter, 1917, an article was published on "Experiments on the treatment of rinderpest with various drugs." Owing to the fact that frequently, people come to this Bureau with the statement that they have cures for rinderpest, it was decided to perform a series of tests with several drugs and publish the results. During the past year we have allowed three different men to try out their cures at the laboratory, and in each case their remedies proved worthless in curing the disease. These men were allowed to administer the remedies themselves and were given entire charge of the animals undergoing treatment. Two men were given three animals apiece and one man was given two animals. In every case the animals died of rinderpest and upon autopsy presented typical lesions of this disease. Two of these men left the laboratory fully convinced that they did not have a cure for rinderpest; one man made the statement that he could cure rinderpest in the field but not in the laboratory. The question naturally arises as to whether he was treating rinderpest while in the field or merely some slight digestive disorders. Another point which has to be considered is the fact that men who profess to have cures for rinderpest ordinarily try them out in localities where the disease is present in rather mild form and where the normal recovery is from 50 to 70 per cent. Therefore it is easy to see that if they are at all shrewd, they can eliminate the fatal cases and in this way obtain a high percentage of cures, providing the material they use is administered in small enough doses and is not too injurious to the animal.

The drugs used in the experiments performed at the laboratory were as follows: (1) Eosin; (2) Medicinal Methylene Blue; (3) Cacodylate of soda; (4) Atoxyl; (5) Quinine sulphate; (6) Camphorated oil; (7) Creolin; (8) Permanganate of potash; (9) Ergot; (10) Iodine; (11) Potassium Iodide; (12) Gentian violet;

(13) Arecolin hydrobromide; (14) nuclein; (15) Formalin; (16) Chlorazene; (17) Castor oil; (18) Alcohol; (19) Fluid extract of Nux Vomica; (20) Fluid extract of Gention; (21) Cannabis Indica. None of these drugs presented any curative value for rinderpest.

A considerable amount of work has been done on locating the various seats of rinderpest virus in the animal body. It has been found that the liver, spleen, lymph glands, intestinal tract and heart muscle are highly virulent. Extracts made from these tissues can be used for virulent material in immunization and hyper-immunization. These experiments have been reported on and will appear in the Philippine Agricultural Review, Vol. X, fourth quarter, 1917.

Work is also being conducted upon a new method of immunizing against rinderpest, which up to the present has been giving very favorable results. By this new method the animals pass through the immunization without developing any symptoms or ill effect from the disease, and are rendered highly immune to subsequent exposures to sick animals and injections of virulent material. A full detailed account of this method will appear when it has been perfected to such an extent that it can be made public.

Work is also under way attempting to devise methods for immunizing against surra, glanders, swine plague, hog cholera and hemorrhagic septicaemia in cattle with good prospects in view for some if not all of the above-mentioned diseases.

DEMONSTRATION AND EXTENSION DIVISION.

AGRICULTURAL DEMONSTRATION SECTION.

Administration project.—Under this project falls the direction of the agricultural demonstration work, the direction of all demonstration stations, the conducting of food production, rice seed selection and tobacco campaign and all other campaigns which deal with the improvement of crops.

At the beginning of the year, there were employed nine Americans and forty-two Filipinos. Two Americans were separated and one transferred to another division during the year, while two Filipinos were also separated from the service, one transferred and two resigned. There were 18 tobacco inspectors appointed under Act No. 2692 and 21 new assistant agricultural inspectors appointed during the year. At the close of the year, there were, therefore, six American and eighty Filipinos in the employ of the demonstration section, located as shown in the table below:

Provinces.	Employees.	
	Ameri- cans.	Filipinos.
Central office, Manila.....	4	3
Cebu.....		3
Bohol.....		2
Iloilo and Capiz.....	1	3
Antique.....		1
Batangas.....		4
Mountain Province.....		4
Nueva Vizcaya.....		(2)
Isabela and Cagayan.....	1	3 (3)
Ilocos Norte, Sur, Abra, La Union and Amburayan.....		8 (7)
Tarlac.....		1
Bulacan.....		3
Cavite and Batangas.....		2
Ambos Camarines.....		2
Rizal.....		1
Laguna.....		4
Pangasinan.....		3 (5)
Nueva Ecija.....		2 (1)
Pampanga.....		2
Mindoro.....		1
Samar.....		2
Leyte.....		1
Surigao.....		1
Misamis.....		1
Oriental Negros.....		1
Sorsogon.....		1
Albay.....		1
Zambales.....		1
Tayabas.....		1
Total.....	6	62 (18)

NOTE.—Figure in parenthesis indicates tobacco inspector.

Of the personnel credited to the central office, one American was on leave in the United States, one was in charge of the Momungan colony in Mindanao and another was in charge of the Singalong Propagation station. One American and one Filipino were detailed as traveling inspectors to supervise the work of the fieldmen.

From the first of the year until June 22, 1917, Mr. E. F. Southwick was in charge of the supervision of the work of this section. From June 23d to the end of the year, Mr. Southwick was on leave in the United States and the supervision of the work was left to Mr. Mariano Billedo, who has since acted as chief of the demonstration and extension division.

During the year, the activities of this section were greatly extended partly due to the establishment of provincial as well as municipal nurseries, the tobacco production campaign, the food production campaign, and later on the rice seed selection campaign. For the purpose of helping provincial officials in the food production campaign, one assistant agricultural inspector was assigned in almost every Christian province in the Islands.

The employees of the demonstration and extension section are the field agents of the Bureau of Agriculture. They gather, disseminate and distribute material and information beneficial

to the farmers, make actual demonstrations of better agricultural methods and modern implements through coöperators and demonstration stations. They introduce new plants and seeds that are of economic importance for distribution to the farmers. They also supervise the placing and maintaining of breeding animals for public use.

Food production campaign.—Although this campaign has been a part of the work of the field employees since the beginning of the demonstration work in the provinces, yet the campaign of last year was more extensive and the result more encouraging than any in the past. The number of vegetable gardens planted under the direction of the field employees was a great deal larger than ever before. Provincial as well as municipal gardens were established on public grounds in many of the provinces, partly for the production of vegetable seedlings for distribution and partly for the demonstration of the proper methods of growing vegetables.

Rice improvement campaign.—This campaign was carried on along two distinct lines, that is introducing Bureau improved seed, and selecting local varieties for seed purposes. The selection of rice seed constituted the major part of the work undertaken during the year. This line of the work was greatly emphasized, especially when the Department of Agriculture and Natural Resources inaugurated a more extensive campaign by employing foremen and laborers for the rice producing provinces. The selection of rice seeds was a success, especially in provinces where cheap labor enabled the farmers to coöperate heartily with the inspectors in the seed selection.

Tobacco production campaign.—This campaign was carried along in connection with the work of the field employees, but the passage of Act No. 2692 enabled the demonstration section to appoint eighteen tobacco inspectors to help carry on the work started by the assistant agricultural inspectors. The increased planting of tobacco this year in the Ilocos Provinces and in Pangasinan can be accounted for partly by the good price paid for tobacco last year but mostly by the campaign inaugurated by field agents of this section.

Public breeding work.—This work properly belongs to the animal husbandry division, but a certain phase of the work has been handled by the field inspectors of the demonstration section. The placing and maintaining of the breeding animals, such as boars, bulls and stallions, were left to the discretion of the inspectors. In fact, when an animal for public breeding was placed in the charge of an inspector, he was held responsible

for the care and success of the same. Cebu, Ilocos Sur, Ilocos Norte, La Union, Pangasinan, Pampanga, Bulacan and Iloilo have made the greatest progress in animal breeding as supervised by this section. During the year 1917, there were 50 boars stationed in the above-mentioned provinces in charge of the field employees of this section, for breeding purposes. Two of these boars died. The other stock for breeding consisted of five stallions, two bulls and one billy. The breeding work has progressed satisfactorily and a great demand for breeding animals has been aroused among the farmers.

Cebu demonstration project.—The prevailing weather conditions during the year have been unfavorable. There was too much rainfall with the result that corn planted in low lying districts was badly damaged.

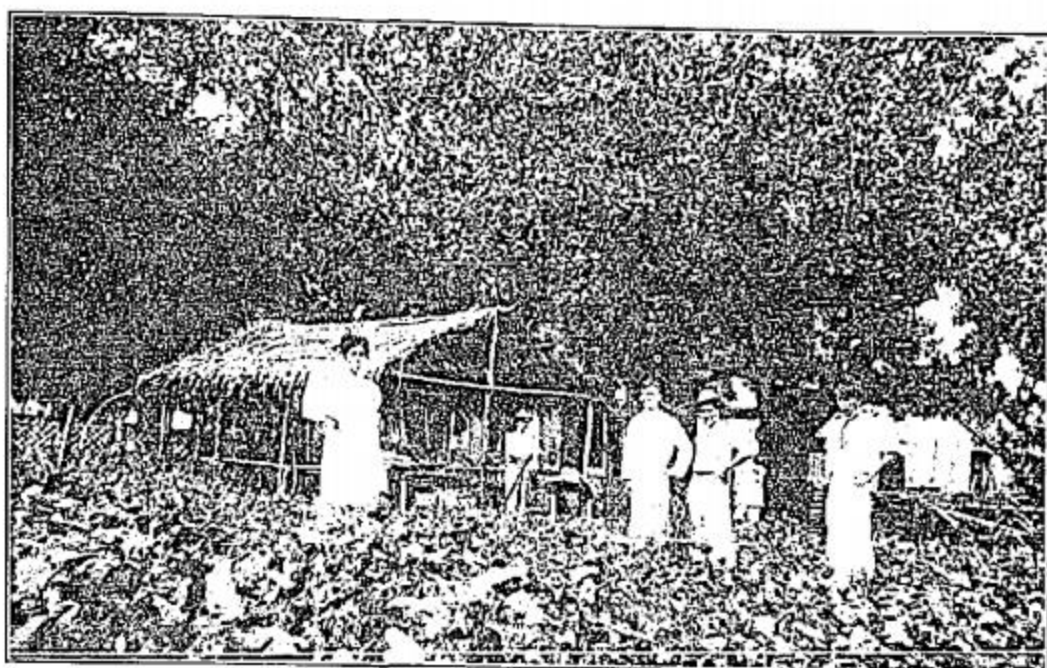
Corn plots, as a whole, were poor due to flood and, in some cases, to excessive moisture. There were altogether eighteen plots planted to native, yellow and Moro corn, but the crop was very poor. One of the plots gave an average of thirty cavans per hectare. Corn crop all over the district was poor and the price per cavan abnormally high.

The tobacco crop was fairly good as a whole. Fine tobacco was raised in the plots in Minglanilla and Argao. Selected seeds from Isabela were used in all cases. The superior quality of the leaves produced over that of the local variety has caused a great demand for seeds.

One plot of Hawaiian sugar cane was harvested during the first quarter and the points available were bought for distribution to new coöperators. There were altogether nine plots of sugar cane planted in Minglanilla, Talisay, Mandaue, Consolacion, Danao, Lugo, Bugó and Mambaling. All the plots were planted to Louisiana striped, save in Mambaling where the native variety was used. The sugar cane plots have grown very poorly and some were entirely a failure. The ratoon crop at Talisay was fair. The sugar cane crop, as a whole, was poor, excepting where planted in well drained land.

The prevailing high price of maguey has served as a stimulus for the farmers. Maguey was planted in all sections at the hill sides and near the seashores. In some cases, lands which were formerly planted to sugar cane or corn, were planted to maguey. Ten thousand sisal bulbils were also planted.

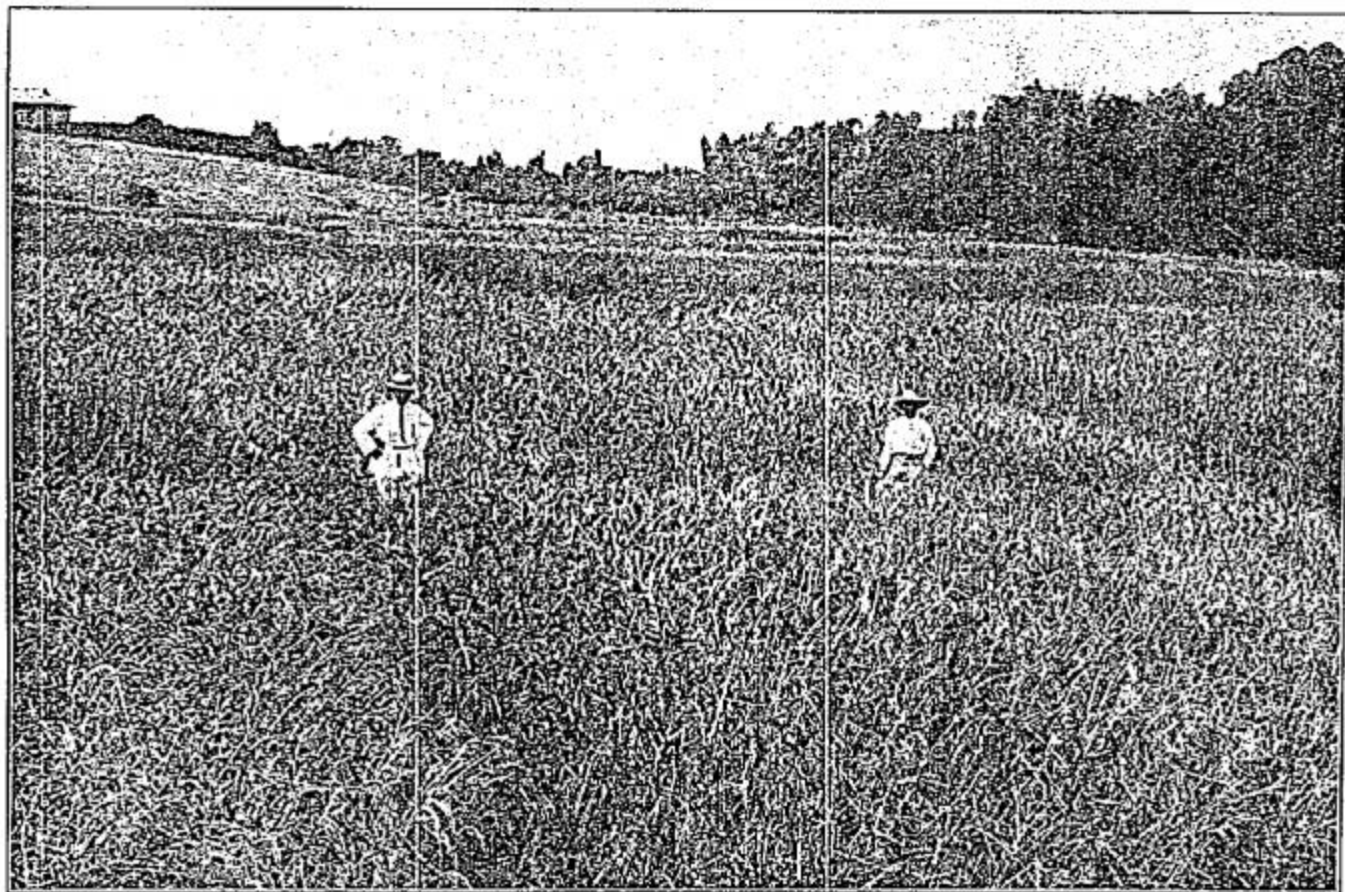
The most salient feature of the work in this district was the progress made in public breeding. At the close of the year there were sixteen boars and two stallions stationed in this district. This work has progressed very rapidly since an assistant



(a) Portion of the Municipal Garden and Nursery at the Plaza of Magsinlal, Iloos Sur, planted with native cowpeas. In the germinating shed 1,037 seedlings of various fruit trees are found at present.



(b) School boys gardening in the Food Campaign.



Varieties of rice grown at Alabang, Rizal.

has been placed to look after it. Not less than 361 mestizo pigs were raised during the year.

Tabonoc demonstration station.—The Province of Cebu appropriated ₱2,000 for the establishment and maintenance of this station. The work was started last May. In this station, there were planted vegetables on a large scale, manga seeds, chico, kapok, mabolo, nangka, papaya and santol and 5,000 coconuts to be planted along the provincial road. The five plots of corn planted last May have made a fair showing and farmers were surprised to find some corn producing from two to three well developed ears to the stalk. Rice plots were also planted at the station, giving fair results.

Iloilo and Capiz demonstration project.—The weather conditions throughout the year were exceedingly unfavorable. Plots that were planted to corn had to be replanted several times, while others had to be abandoned. The weather was favorable, however, for the planting of more rice than in any previous year.

There were altogether fifteen corn plots handled throughout the district during the year. The corn crop all over the district was a poor one, as a whole.

Twenty rice coöperators in Capiz and Iloilo, of the Apostol, Conner, Cruz, Inantipolo and Roxas rice varieties, were handled. The results of these plots were not reported at the end of the year.

During the last quarter, the efforts of the personnel of this project were concentrated on the selection of rice seed. In the Province of Capiz alone, there were 2,646 gantas of rice selected, while in Iloilo 20,408 gantas were selected for 1,082 owners. Great interest in this work was shown by both the municipal officials and farmers, especially in the Province of Iloilo. In many cases, councilors and lieutenants of barrios, at their own request, were given instructions to fit them for instructors, and, where area to be covered by one foreman was large, these men personally supervised the work without remuneration. There was no record kept of the amount of seed selected under the supervision of these public spirited men. The rice crop in the district was a great deal better than in any previous year. Many farmers, encouraged by the favorable weather and suggestion of the inspectors, planted a second crop of rice, for the first time, right after the first crop was harvested. The rice planted looked promising at the end of the year.

The prevailing wet weather in Capiz was taken advantage of by the farmers in planting coconuts and hemp, and by attending lectures on food campaign, poultry raising, stock raising and selection of seeds.

The breeding work in this project progressed satisfactorily. There were 6 boars, one Nellore bull, one stallion and one Spanish goat stationed in this district for breeding purposes.

Iloilo demonstration station.—During the first quarter of the year, there were planted at the station $\frac{1}{2}$ hectare of guinea grass, $1\frac{1}{2}$ hectares of velvet bean, $\frac{1}{2}$ hectare of peanuts, $\frac{2}{3}$ hectare of cowpea, a plot of Isabela tobacco and about 15,000 kapok seeds planted. The corn plot planted during the preceding quarter was harvested. There were 4,000 selected ears for seed purposes and about 2,500 ears of feed corn. Another crop of corn was harvested during the third quarter producing an average of 30 cavans per hectare. Corn planted during the latter part of the year was damaged by excessive rain.

The tobacco planted at the station last year produced an average of 31.2 leaves per plant. About 45 per cent of the tobacco produced could be classed as first-class in size, but the remainder, as second and third.

A small nursery was also installed at the station where chico, banana, kapok and other fruit trees were planted for distribution purposes. A tobacco seed bed was also planted for distribution purposes.

One of the great attractions at the station was the presence of large Yorkshire boars. Seventeen young pigs were sold for breeding purposes.

Batangas demonstration project.—As a whole, the general field crops of Batangas suffered from drought and strong winds during March, April, August, October, November, and December. The municipalities that have suffered most were, Bolbok, Batangas, Loboo, Bauan, Taal, Lemery, Alaca, Balayan, Tuy, Lean, Nasugbu and Calatagan.

During the year, there were 54 coöperators in 14 municipalities for Moro corn. The results of these plots, due to climatic causes, were discouraging, except in two plots, one in Lipa and another in Rosario which gave an average of 60 cavans per hectare. The corn crop, as a whole, in the province was very poor.

Six coöperators of Bureau rice, such as Inantipolo, Apostol and Cruz, were also handled, but the results, due to drought and strong winds, were discouraging. The rice crop in the whole district was a great deal better than the preceding year.

The selection of rice seed, which was one of the important works carried out during the year, has given satisfactory results. Both upland and lowland varieties of rice were dealt with. The inspectors of the Bureau of Agriculture and the

laborers paid by the Department of Agriculture and Natural Resources were given a hearty coöperation by the farmers. There were two methods adopted in the disposition of the seed selected by laborers paid by the Government, one was by giving the whole amount of seed selected to the owner for future planting and the other by getting one fourth share of the seed selected. The amount of seed selected in both methods was considerable. The farmers, who were helped in the selection of seed will become rice coöperators this year.

Batangas municipal nursery.—This was established on May 26, 1917, with an appropriation of ₱680. From this nursery 11,350 vegetable seedlings and 2,000 assorted fruit trees, including coffee, were distributed since its establishment. Great interest was shown by the municipal officials and a bigger appropriation for the year following was contemplated.

Lipa demonstration station.—The whole farm force of the station has been busily engaged in putting every bit of ground under cultivation. During the year different farm crops, such as rice, corn, camote, gabe, potato, ginger, papaya, banana and other vegetables were planted. Rice, corn and forage plants suffered much from drought.

The coffee work was the most important carried at the station in order to revive the coffee industry of Lipa. During the middle of the year, there were at the nursery 19,400 seedlings, 9,900 of which were sold during the year and the rest to be disposed of during the following rainy season.

A model orchard was also planted with 367 Excelsa and Liberian coffee seedlings. The trees were spaced four meters apart temporarily shaded with native tañgantañgan, which, by the way, made a good demonstration by itself. Anas were planted for permanent shade.

The Bureau of Agriculture furnished the Lipa farmers 12,092 coffee trees, free of charge.

Antique demonstration station project.—The weather condition in this project was favorable for rice. The stand of rice of both the upland and lowland varieties was such that there were not enough laborers to harvest the crop at the proper time and it was estimated that there was a loss of from 10 to 15 per cent of the total crop. A great deal more rice was produced than formerly.

Several rice coöperative plots were secured, varying in area from one to four hectares. Apostol, Cruz and Inantipolo were the varieties used. The lowland rice coöperative plots did not show satisfactory results, owing to the fact that the planting

was too late. The coöperators were satisfied with the crop obtained and seeds were selected from the plots for future planting.

The selection of rice seed of the local varieties was also carried among the farmers. In San José and Sibalom, there were 250 gantas so selected and the owners will become rice coöperators next season. The selection of local seed among the farmers was a difficult task on account of the mixed varieties that were planted.

Lectures were delivered whenever there was a gathering and the subjects discussed were rice and corn culture, seed selection, vegetable home garden, the improvement of poor soil, the planting of bananas and other fruit trees, and the improvement of livestock. It was estimated that there were more than 2,000 people that attended these lectures.

The demonstration station of San José.—About three hectares of the station were planted to Apostol and Cruz varieties of rice. This area produced about 100 cavanos. The average yield previously was 15 cavanos per hectare. The land was rather poor and had to be planted with cowpeas and other leguminous plants to improve its quality. All of the rice seed produced will be sold only for seed purposes.

Moro corn was also planted at the station, but gave poor results on account of caterpillars and strong winds. Other crops planted at the station were sweet potatoes, lyon beans and cowpeas for distribution among the farmers.

Mountain Province and Nueva Vizcaya demonstration project.—This project was under the direct charge of Mr. W. H. Cropper, assistant agricultural inspector, until his resignation at the end of the third quarter. Mr. Cropper was succeeded by Mr. Juan Gaerlan, agricultural inspector. Messrs. Macario Guerzon, Modesto Dirige and Leon Calika, all assistant agricultural inspectors, were the assistants of Mr. Gaerlan.

Messrs. Victorino Cruz and Ernesto Cuisia, tobacco inspectors, were appointed for Nueva Vizcaya during the third quarter.

For lack of personnel, there was no agricultural demonstration work carried in the Subprovince of Benguet. Tobacco demonstration was carried on in Nueva Vizcaya by two tobacco inspectors.

The weather condition throughout the district was rather unfavorable, due to excessive rainfall especially in the northern districts of the Mountain Province.

Due to the adaptability of this district to coffee, a great deal of time and effort was concentrated in furthering the growing

of this crop. Nurseries had been established, plants distributed and planted, old trees were pruned, cultivated and mulched under the supervision of the inspectors. New varieties of coffee were also introduced and from all appearances they thrived well. There were 54,465 coffee seedlings of the Robusta and Arabica varieties, 34,700 of which were planted in Lepanto and 19,765 in Bontoc planted during the year.

The tobacco campaign has given good results. In Bontoc Sub-province 50,050 seedlings were planted and in Lepanto 21,571.

Catanduanes (Albay) demonstration project.—Mr. E. H. Koert, assistant agricultural inspector, has charge of the Bicol breeding station and he carried demonstration work only when his work at the breeding station allowed him. The only demonstration work he could perform was the growing of vegetable seedlings and other plant materials for distribution among the farmers, and vegetable garden as a model. The sale of vegetables at the station amounted to ₱47.20.

Isabela and Cagayan demonstration project.—The tobacco crop as a whole was rather poor and less tobacco was produced owing to the excessive rains during November and December, 1916, and also during the harvest period. There were 71 coöperators representing an area of 63 hectares. In many cases the tobacco coöperators were also corn coöperators.

There were 69 corn coöperators representing an area of 96 hectares. The coöperators obtained an average of 39 cavans per hectare, while in general only about 22 cavanes per hectare was produced. The corn crop, as a whole, was good.

The rice crop in Isabela was considered very poor and the few coöperators were discouraged. In Cagayan the rice crop was better and the few coöperators obtained an average of 49 cavanes per hectare, 9 cavanes more than the general average.

During the months of June, July, and August, 1,465 liters of seeds were purchased, 900 liters of which were sent to Cagayan, 120 liters to the Bureau of Agriculture, 80 liters to Juan Bunoan, 30.5 liters through the mails and 58.5 liters to 160 persons.

The tobacco seeds planted during September were almost all destroyed by rain and floods. It was estimated that only one-third of the total seedlings on the seed beds was saved.

The inspectors in this project were also appointed as special forest officers for the issuance of gratuitous timber licenses for tobacco drying sheds. In Isabela 2,586 of these licenses were issued, while in Cagayan 1,267. However, not more than 600 were energetic enough to build drying sheds during the year.

During the first month of the year the Valley was visited by

a swarm of locusts, but the activity of the officials and citizens prevailed.

About 43,000 packages of vegetable seeds were distributed during the last quarter. Notwithstanding the excessive rains and floods, it was estimated that 10,000 would be benefited by the home gardens planted.

Ilocos Norte, Ilocos Sur, La Union, Abra and Amburayan demonstration project.—During the first quarter, the climatic conditions in this district were unfavorable. It was hot, dry and windy and with only a few showers. Due to this unfavorable condition, it was impossible to plant much corn and sugar cane. However, the weather was favorable for the rice crop.

The number of rice coöperators in this project was 27, representing an area of 86,930 square meters. The average production of these plots was not reported at the end of the year.

Of the nine corn coöperators handled, the production ranged from 30 to 100 cavanese per hectare. The maximum yield was obtained in one of the plots at Narvacan.

Owing to the fact that the tobacco inspectors were appointed late, there were only 26 tobacco coöperators handled. All of the plots were growing nicely. In the whole district, there was great interest in tobacco and a great deal more tobacco was planted during the year than in any previous year. Thirty demijohns of Isabela tobacco variety furnished by the Tabacalera Company were distributed in the district.

A total of three provincial and eighteen municipal nurseries were in operation during the year in this project. The materials and labors were furnished gratis by the people concerned. These nurseries were somewhat abandoned during the last quarter, due to the food production and rice seed selection campaigns.

One of the most important works carried on in this district was the food production campaign. About ten sacks of vegetable seeds were distributed. All the assistants assigned in this project were mobilized in this work, and, with the hearty coöperation of the provincial, municipal, Insular officials and the people, the campaign produced good results. Home gardens, municipal gardens and provincial gardens were all in evidence.

The rice seed selection campaign was emphasized more this year than in any year before, especially when the Department of Agriculture and Natural Resources hired laborers to carry on the work. This line of work was very successful and the local officials as well as the farmers coöperated heartily.

The public breeding work in the project progressed satisfactorily. There were fourteen boars, (one of which died), and one stallion in use in the whole district.

Tarlac demonstration project.—Owing to the lack of funds, this project was not attended to until the last month of the year, when Mr. Juan Naui, assistant agricultural inspector of the Department of Agriculture and Natural Resources was placed in charge. Mr. Andres Elviña, assistant agricultural inspector of the Bureau of Agriculture was detailed as assistant.

The only work accomplished in this project was the selection of rice seeds on large scale as adopted by the Department of Agriculture and Natural Resources. This work was carried on in the municipalities of Tarlac, Victoria, Paniqui, and Camiling. Being a new work and probably partly due to the scarcity of labor and the abundance of good crops, good coöperation was not available, except in the municipalities of Paniqui and Camiling.

Bulacan demonstration project.—During the first four months of the year, it was rather dry and windy, but later on the weather was favorable for sugar cane, corn, and rice.

Of the fourteen plots of corn handled during the year, those planted at Quingua gave the best results. Severo Marcelo, one of the coöperators, produced 21½ cavanese on ¼ hectare, or an average of 85.3 cavanese per hectare. Another coöperator, Inocencio de Vera, produced 41 cavanese from ½ hectare, or 82 cavanese per hectare. The other eight plots at Quingua had to be sold green and produced an average of ₱85 per hectare. The corn planted during the dry season was rather poor, but the main crop was good.

There were 20 rice coöperators handled during the planting season, but, due to the fact that one of the inspectors in charge was transferred, some were dropped. The results of these plots are not reported as yet.

Two sugar plots of Demerara 1,335 and H-20 were planted at Bocaue and San Miguel. At the time the two transferred inspectors left these two districts, these plots were making a good growth.

The food production campaign was one of the important works carried in this district. Lectures emphasizing the need and means of increasing production of cereals, vegetables, secondary crops and poultry were discussed. Thousands of packages of vegetable seeds were distributed. Local officials, as well as the masses have responded enthusiastically and home gardens were multiplied.

Being a rice producing province, the selection of rice seeds was the most important work carried in this project by the inspectors. This line of work was especially emphasized when the

Secretary of the Department of Agriculture and Natural Resources hired laborers and foremen to push this work. The work was successful.

The Province of Bulacan appropriated ₱1,500 for the establishment and maintenance of a station at Malolos. The first corn crop raised was interplanted with cowpeas and peanuts, in order to improve the rather poor quality of the soil. About four-fifths of the total area of the station was planted to rice during the rainy season. The varieties used were Apostol, Roxas, and Cruz, and also Macan, a local variety. A good crop of rice, considerably better than adjoining fields, was produced.

The nursery has maintained several seedlings of the local varieties of fruit trees, such as mango, chico, tamarind, mabolo, papaya, cacao, ate, etc., etc., most of which were distributed from time to time.

Bataan and Cavite demonstration project.—The weather in Bataan during the first four months of the year was rather hot, and rice as well as corn plots planted in the previous quarter suffered severely.

The rice crop in the district was good as a whole especially the lowland, but the upland was slightly damaged due to drought. The results of the ten coöperative plots, (lowland Bureau rice) handled during the year ranged from 31 to 52 cavanese per hectare, while in general the average production was about 20 cavanese. The rice varieties used were Apostol for lowland and Inantipolo for upland. Each coöperator has selected two cavanese of seed for next season.

There were also 20 coöperative corn plots planted during the year. Those planted early in the year suffered from drought, but the main crop was good. Sincamas plots were also maintained to demonstrate the advantage of proper cultivation.

The most important projects carried on during the year were the food campaign, rice seed selection and the establishment of a small provincial nursery. In the food campaign lectures on agricultural topics were discussed and vegetable seeds distributed. In the seed selection of rice, many farmers were helped, but the majority could not afford to select, due to good crop and scarcity of labor.

The demonstration station of Balanga.—This was established with an appropriation of ₱150. It was the smallest nursery established during the year in any province in the Islands. Due to the limited space of the nursery, no other work but the propagation of plants for distribution could be undertaken.

Ambos Camarines demonstration project.—The agricultural

demonstration work in this province was started last April, when the provincial board appropriated the sum of ₱1,000 for the establishment and maintenance of a nursery. Mr. Eugenio R. Abrigo, agricultural assistant, was placed in charge and Mr. Hilarión Francisco, assistant agricultural inspector, as assistant. The weather condition was favorable throughout the district, but during October a flood occurred which destroyed rice in low lying district.

Being a rice producing province, the most important work carried in this project related to the improvement of this crop by the introduction of the improved Bureau varieties, better cultivation and seed selection from local varieties. Fifteen coöper-ators of Apostol, Roxas and Conner varieties were secured. The results of these plots will be reported later.

The demonstration station was planted to different vegetables, cowpeas, corn and peanuts all the year around. The results obtained were all satisfactory. Cacao and coffee were also planted in the nursery for distribution purposes. The lowland portion of the nursery could not be planted to rice, since the province could not furnish a work animal.

The food campaign carried in this project produced satisfactory results. Every municipality had its garden where vegetable seedlings for distribution to the farmers were maintained. The provincial and municipal officials coöperated efficiently with the inspectors. Vegetable seeds were distributed by the thousands in packages.

The rice seed selection campaign, as outlined by the Secretary of Agriculture and Natural Resources, was also carried in this province. The farmers, as well as all officials concerned, were enthusiastic about this work. Coöperation could not be had on a large scale, due to the scarcity of labor.

Rizal demonstration project.—The weather was so warm during the first quarter that agricultural operation on a large scale could not be undertaken. The weather was favorable, however, for rice.

The three plots of rice which were not reported in 1916 produced good results. The Apostol variety gave an average of 42 cavanese, while the Cruz variety 65 cavanese.

Much attention was devoted to the selection of rice seed of the 1916-1917 crop. Municipal officials, as well as numbers of agricultural societies coöperated heartily in this work and 68 cavanese of rice were selected for 117 farmers.

Most of the garden days celebrated in Rizal were attended by

the inspectors. Vegetable seeds, plants and circulars were distributed and agricultural topics discussed.

The sugar cane demonstration plot at Pasig has produced 5,000 points of yellow Caledonia, 4,900 of Louisiana striped, 4,000 of H-309 and 1,000 of H-69, and also ₱12.00 worth of cane sold. All of the points were distributed to farmers in Pasig, Mariquina and San Mateo. All of these canes have grown satisfactorily.

The selection of rice seed on a large scale as outlined by the Department Secretary was also carried out with success.

The campaign for producing more food stuffs was also carried on with vigor and thousands of packages of vegetable seeds were distributed.

Laguna demonstration project.—The weather during the first quarter was hot and dry, with a shower every ten or fifteen days in the lowland, while in the upland, there were frequent rains. The drought during August affected somewhat the upland rice, but the lowland was good in every respect. Weather conditions also favored all other crops.

Being decidedly a rice producing province, the most important work carried in this project was that related to the improvement of cultivation and increase in production of rice. Instruction in seed selection on a large scale was successfully carried out and the inspectors were kept busy attending and instructing the farmers in this line of work. During the first quarter, a total of 387 gantas of seed rice were selected by the inspectors and the farmers. Three thousand gantas of all of these seeds were used in planting last season. The two plots of rice harvested during the first quarter have an average of 59 cavares per hectare, while, in general, about 35 cavares were obtained. There were 32 rice coöperators maintained during the year, producing from 57 to 156 cavares per hectare. The selection of rice seed on a large scale was also carried out during the last quarter with good results.

An excellent crop of corn was harvested by 8 corn coöperators handled in the district, with a yield ranging from 40 to 86 cavares per hectare. By carrying a vigorous food production campaign, the farmers throughout the province have harvested an excellent crop of sweet potatoes, squash, garlic, gabi and other vegetables. Gabi was selling at twenty-five to thirty-five centavos per sack. Vegetables were so abundant that farmers had difficulty in disposing of all of their products.

Santa Cruz demonstration station.—The work at the station has been carried out successfully, especially during the first quar-



Cacao tree about 4 years old carrying 65 fruits, Pagsanjan, Laguna.

ter of the year. During the third quarter, the ground was too wet to work, but later on the station was put in good condition. Large amounts of vegetable seeds and seedlings, and also coffee, were raised for distribution among the farmers. One-half hectare of native yellow corn gave a yield of 41.5 cavanese of shelled corn. Vegetables were planted on a large scale. The gabi plot planted at the station produced an average of 160 cavanese per hectare. At the end of the year, there were planted at the station one-fourth hectare of tomatoes, one-fourth hectare of Irish potatoes, one-fourth hectare of different varieties of beans, one-fourth hectare of American sweet corn and a plot of vegetables. One hundred Liberian coffee seedlings were also planted all of which were in excellent condition at the close of the year.

Pangasinan demonstration project.—On account of the prevalence of locusts in the first two months in the Province of Pangasinan, as well as in the neighboring provinces, the entire field force of this project was loaned to the pest control section for detail in the locust work. Very little attention could therefore be given to agricultural demonstration work during the said period.

From the beginning of the year until the middle of March, the weather was dry, but afterwards the weather changed favorably for the farmers. The early planted tobacco plants were affected by the drought, but the late ones have produced better results. The tobacco crop produced was considered greater than the year previous. The tobacco plot, consisting of 12,000 square meters, has yielded two thousand manos.

Due partly to the high price paid for tobacco last year and principally to the campaign carried by the assistant agricultural inspectors, as well as tobacco inspectors in this province, a considerable area has been planted, an area estimated to be more than that corresponding to the previous year. There were twenty-one coöperators handled during the year. The tobacco seedlings planted so far were growing nicely.

During the year, there were twenty-two coöperative plots of rice maintained. All of these plots have shown up satisfactorily and the yields, some of which were expected to be exceptionally good, will be reported as soon as threshed out. All of the seed used in these plots was selected. The selection of rice seed was carried to its full extent this year, especially when the Department of Agriculture and Natural Resources employed foremen and laborers for this purpose. About twenty-thousand farmers were helped in the selection of rice seed. The local officials, as well as the farmers, were greatly interested in this work and

good coöperation by those in charge of the work was given. The rice crop, as a whole, in the province was considered better than the preceding year.

The food production campaign was also one of the most important works carried during the year. Several lectures on several occasions were given with large attendance and thousands of package of vegetable seeds were distributed. The masses have responded enthusiastically in this campaign and fine home gardens were found almost everywhere. There were two hundred and sixty garden coöperators handled during the year.

Nueva Ecija demonstration project.—Three inspectors were stationed in this project for the purpose of making a campaign in increased production, as well as improvement of the quality of tobacco. Due to the campaign carried out in the province, larger area was planted to this crop than in any previous year. The quality of the crop produced was better and the quantity increased. Great interest among the farmers was manifested and large areas were already planted at the end of the year.

The campaign for food production, as well as selection of rice seed was also carried out in this province. The farmers were interested in the selection of seed, but due to a bountiful crop of rice and the scarcity of laborers, not much cooperation could be rendered.

Pampanga demonstration project.—As in the case of many of the other projects, the weather condition in Pampanga during the first quarter was dry, as a whole. The planting of secondary crops could only be carried in places where irrigation was available. The weather was, however, favorable for sugar cane, rice and the main crop of corn.

The number of Moro corn coöperators handled during the year was seven in all. This corn has made satisfactory showing and in one of the plots an average of 72 cavanese per hectare was obtained. Farmers were, however, reluctant in planting this on a large scale, due to its susceptibility to weevil attacks and other pests. Other plots handled were two plots of Momungan sweet potatoes, five plots of peanuts and two of sugar cane and six plots of rice. The plot of sugar cane was for the purpose of demonstrating to the people the advantages of selected points, introduction of foreign variety, wider distance in planting and irrigation. The plots were a success and people were convinced of the practicability of changing the old method of planting. Most of the rice coöperators were satisfied with the yields obtained, while others were disappointed, due to negli-

gence in weeding their rice fields. The yields will be reported later.

Other important works carried during the year were the food production and the rice seed selection campaigns. Both of these campaigns were a success. In the food campaign several lectures were delivered in all the municipalities and tens of thousand of packages of vegetable seeds distributed to the farmers. The provincial, as well as municipal officials cooperated effectively in this campaign and, as a result, many fine home gardens were maintained. The rice seed selection campaign was also a success.

Mexico demonstration station.—The establishment and maintenance of this station were furnished by the municipality of Mexico until the fourth quarter, when the province appropriated an amount of money to carry the work on a larger scale. The station was increased to four hectares in area and three work animals were purchased. Three laborers were maintained by the province and one by the Bureau of Agriculture.

Part of the station was planted to vegetables all the year around and considerable of the product was sold in the market. At the end of the year, there were found plots of Moro corn, Iowa Ideal and native corn, sugar cane plots of both native and imported varieties, plot of different vegetables and numerous seedlings of different fruit trees in the nursery. This station promises to be one of the best stations of the demonstration division.

Bohol demonstration project.—The weather conditions throughout the year were favorable to rice, but for corn, it was rather unfavorable. There was too much rain.

The most important works carried during the year were food production campaign, seed selection campaign and the establishment of the provincial nursery. Lectures were delivered in all accessible municipalities and vegetable seeds and seeds and seedlings were distributed. Almost every municipality had its vegetable garden and home gardens were numerous.

In the selection of rice seed the intelligent farmers were greatly interested since accounts of the results of rice plots in Laguna Province has reached them. Many farmers were helped in seed selection and in spite of the fact that the work was new to the people, it was successful. In the Bohol rice colony alone, 98 cavanos were selected or one cavan per each colonist. In connection with this work, the provincial board allotted ₱10,000 for the purchase of selected seeds to be resold later to the needy farmers. The rice crop was good. Besides rice, corn seed was also selected.

The establishing of the provincial nursery in the municipality of Carmen was started last May. The provincial board appropriated ₱1,500 for its maintenance. The station contains 14 hectares of cogon land.

Mindoro demonstration project.—The most important works carried in this district were the food production campaign and selection of rice seed. The food campaign could be considered the most effective, since most of the vegetables used in Calapan and neighboring towns were formerly either imported from Manila or from Batangas. Lectures were delivered in many places urging the people to raise enough vegetables for their own use. Vegetable seeds were distributed with planting instructions. As a result of the campaign, many home gardens were maintained.

Due to the lack of personnel, the campaign of rice seed selection was only carried in Calapan. Many farmers were instructed in this line of work.

Notwithstanding the fact that the provincial board of Mindoro was the first province to appropriate money for the establishment and maintenance of a nursery, yet for some reasons or other, the work had to be delayed until December, when the provincial board finally purchased the piece of land intended for the nursery. Work on sheds and plots was only started at the end of the year.

Samar demonstration project.—The work carried during the year was for the food campaign, rice seed selection and the establishment of the provincial nursery. In the food campaign, lectures on different agricultural topics were discussed and vegetable seeds distributed. In the selection of rice seed, many farmers were also helped, but due to the lack of good means of transportation, the sphere of the work was limited from Calbayog to Catbalogan. Preparatory work in the nursery, such as fencing, building sheds and digging stumps was accomplished. The work was greatly handicapped, owing to the fact that the provincial government failed to obtain even a single work animal.

RURAL CREDIT SECTION.

Eight rural credit associations were incorporated between October 1916, when the work was started, and January 1, 1917. During the year 1917 seventy-four more associations were incorporated and 142 other associations were organized, the capital of which has not been entirely paid in, so these have not yet incorporated.

The 82 associations in existence January 1, 1918, are distributed as follows:

Provinces.	Municipalities.	Capital stock.	Capital paid at incorporation.
Abra.....	Bangued.....	P3,400.00	P 850.00
	Barbaza.....	5,000.00	250.00
	Bugasong.....	10,000.00	1,220.00
	Daso.....	5,000.00	270.00
	Latanan.....	2,000.00	130.00
Antique.....	Pandan.....	5,000.00	270.00
	Patnongon.....	3,000.00	266.00
	San Jose.....	5,000.00	270.00
	San Remigio.....	1,000.00	94.00
	Sibalom.....	1,000.00	270.00
Bataan.....	Balanga.....	1,000.00	250.00
	Orani.....	1,000.00	250.00
	Samal.....	1,000.00	250.00
Batangas.....	Batangas.....	1,500.00	375.00
Bohol.....	Ibaan.....	500.00	125.00
	Ballibisan.....	5,000.00	1,000.00
	Bigaa.....	1,000.00	250.00
Bulacan.....	Bocaue.....	600.00	150.00
	Bustos.....	5,000.00	250.00
	Marilao.....	5,000.00	274.00
Cagayan.....	San Miguel.....	10,000.00	1,380.00
	Apurri.....	10,000.00	500.00
	Dasmariñas.....	2,500.00	202.00
Cavite.....	Imus.....	2,000.00	290.00
	Malabon.....	4,000.00	260.00
	Naic.....	1,000.00	250.00
	Rosario.....	3,000.00	250.00
	Tanza.....	1,000.00	250.00
	Bacarra.....	2,040.00	810.00
	Badoc.....	1,600.00	400.00
	Bangui.....	1,168.00	292.00
	Banna.....	2,000.00	478.00
	Batag.....	1,850.00	340.00
	Burgos.....	1,000.00	250.00
	Dingras.....	5,000.00	266.00
	Laosag.....	10,000.00	1,040.00
	Pacay.....	2,760.00	690.00
	Pasquin.....	1,380.00	340.00
Ilocos Norte.....	Piddig.....	1,054.00	266.00
	San Nicolas.....	1,320.00	330.00
	Sarrat.....	1,808.00	462.00
	Salsona.....	2,280.00	570.00
	Vintar.....	2,080.00	520.00
	Lapog.....	1,000.00	250.00
	Narvacan.....	1,000.00	250.00
	Santa.....	1,000.00	250.00
	Santa Maria.....	1,000.00	250.00
	Ugayan.....	10,000.00	540.00
Isabela.....	Cabuyao.....	10,000.00	714.00
Laguna.....	Pangil.....	4,000.00	230.00
Leyte.....	Calbiran.....	5,000.00	412.00
Misamis.....	Jimenez.....	10,000.00	1,905.00
	Misamis.....	10,000.00	755.00
	Tagaluan.....	10,000.00	570.00
Mountain Province.....	Tagudin.....	10,000.00	600.00
	Cabanatuan.....	1,000.00	250.00
	Lupao.....	840.00	210.00
Nueva Ecija.....	Munoz.....	1,200.00	300.00
	Nampicuan.....	2,000.00	580.00
	San Isidro.....	10,000.00	510.00
	San Jose.....	500.00	126.00
Pampanga.....	Mexico.....	8,000.00	2,000.00
	Santa Rita.....	10,000.00	1,330.00
	Alcala.....	10,000.00	540.00
	Binalonan.....	10,000.00	706.00
	Calasiao.....	10,000.00	563.00
	Malasiqui.....	10,000.00	1,138.00
	Mannaog.....	10,000.00	556.00
Pangasinan.....	Mangaldan.....	10,000.00	510.00
	Mangatarem.....	10,000.00	504.00
	Pozorrubio.....	10,000.00	900.00
	San Carlos.....	10,000.00	1,128.00
	San Nicolas.....	10,000.00	1,254.00
	Tayug.....	10,000.00	502.00
	Villasis.....	5,000.00	270.00
	Binangonan.....	10,000.00	500.00
	Mariquina.....	5,000.00	250.00
	Montalban.....	10,000.00	620.00
Rizal.....	San Mateo.....	10,000.00	500.00
Sorsogon.....	Taytay.....	6,000.00	300.00
	San Jacinto.....	10,000.00	945.00
Tarlac.....	Moncada.....	5,000.00	250.00
Grand total.....		409,880.00	41,483.00

The above figures do not show the actual capital now on hand. Shares are being constantly sold in every association, and in no association has capital been withdrawn. Complete statistics are not on hand. Most of the 82 associations have had less than six months existence and only eight have had a full year since organizing. In the case of Sibalom the above table shows a capital of ₱270, while in fact they have a share capital of ₱2,324 paid in; Balanga appears in the above as having ₱250 while their paid in capital is ₱898; Samal appears as ₱250 while their paid in capital is ₱1,378. All associations have not had as marked an increase as the above, *but all have advanced*, and San Miguel, Malasiqui, San Carlos, and Mexico have passed the ₱3,000 mark. The paid in capital to-day is nearer the ₱100,000 mark than the ₱41,483 tabulated above.

It was no light matter to introduce an entirely new plan and to instill a sense of individual responsibility in the members by obligating them to assume all the work and responsibility to make these rural credit associations really self managing and self propagating. It would often have been easier to have stepped in and managed their affairs than to have patiently taught the much needed lesson of self-dependence and self-reliance. The degree of success attained is partly due to the merciless exactions of the usurers which have driven the public patience almost to exasperation so that any suggested relief looked good, while the endorsement of public spirited men in all walks of life satisfied all that the proposed village bank was worthy of confidence. There is no need to argue or convince people of the utility or necessity of these associations. This is being effectively done by friends of the cause in each community, who explain the details and remove the fears of the timid. A word of recommendation of rural credit by a man in whom the masses believe, is more effective than a convincing speech by an outsider. It is also proper to state that these friendly advocates received their information and inspiration largely from the press, whose columns are unstintingly open to the Bureau to give wider publicity to rural credit items and happenings in various towns, thus educating and enthusing persons in remote barrios. So really, as a consequence of these preparatory agencies, the ground had been plowed, the seed had been sown and usually it was the agreeable task of the agents to be invited to come and make out the incorporation papers, advise in preparing by-laws, and to instruct the boards of directors in their duties to the members and to the associations and start them off right.

Personal supervision and advice has been fragmentary and

irregular owing to the limited number of agents and the numerous calls for matters not of greater importance, but which appeared more pressing. Correspondence at best is a mere makeshift for conveying thought or securing action. Letters are easily laid aside while the human monitor insists on something being done and is able to answer objections and suggest lines of action and can also be sure that the person addressed really understands the matter at issue.

Working of associations.—It has been a constant surprise to note the facility with which the associations have carried on their work when once the details of the plan were understood by the members. The Corporation Law requires that the incorporators, who can not exceed 15 in number, must select 5 as directors, these to serve until at a regular meeting of the shareholders, to be held at a time fixed in their by-laws, when a new board is elected. The familiarity with municipal procedure makes conducting the affairs of an association an easy task, as is also the keeping of the minutes and other details.

The law (2508) appoints the municipal treasurers as ex-officio treasurers of the associations and the Insular Auditor as auditor of the accounts. These two wise provisions have silenced all doubts as to whether money can be safely entrusted to the associations by prospective share holders. Nothing has contributed more to place these associations in the highest place in the confidence of the public, a place we will always strive to maintain. The boards of directors receive applications for loans. These are either approved or disapproved. If approved a voucher or cheque is drawn on the treasurer, who pays the money to the borrower.

There are cases where the boards of directors were selected on account of the social standing and prominence of the men rather than on the grounds of a desire to advance the economic interests of agriculture and supply necessary loans to the needy farmers. It has required rare tact and diplomacy to induce such to resign without giving offense and creating opposition. We have tolerated inaction in some cases rather than to create dissention.

Rural credit agents.—It is a pleasure to put on record the hearty appreciation of the loyal, efficient service which these agents have cheerfully rendered at all times. Each one is anxious to learn all that can be known about rural credit, and without exception each has gladly served his countrymen and sought to explain the possibilities of rural credit in its bearing on the individual, the town, the province, and the whole country. That they have succeeded in a marked degree is shown by the results

already achieved. These agents have been invited by governors, senators, representatives, municipal officers, and public spirited individuals to come and assist in campaigns. They have been sent and in every case have they shown ability, keen interest, and gentlemanly qualities of the highest order. More agents are absolutely necessary to successfully supervise and develop this rapidly growing work. These new associations need advice. They need some experienced person to encourage and guide the members and officers at the start. They meet many perplexities in Law 2508 and its application which can be explained. They start with a small capital and small experience. Some one must cheer them during the formation period when they often look at the height of the financial hill they have to climb and the small start they have made. A few words of encouragement and counsel works wonders. It is a serious omission not to follow up each association by frequent visits during which the wide awake agent can tactfully help them in a hundred ways.

Results.—As previously stated, every one of the 82 associations has advanced in the matter of increasing its capital and membership. Partial reports on "Amount loaned and the number of borrowers," show that in only a few instances have the associations remained inactive and these have begun with the new year. Complete returns are not at hand.

It is impossible in this limited report to mention each one of the 82 associations. It is true there are a few associations under very low pressure, hence advancing very slowly; with a larger force of agents these will be speeded up. Most of the associations are new and hence inexperienced, but they are cheerfully doing the best they know how, and willingly learning from the circulars and letters sent out frequently and any visits paid by agents. The agents are also learning by experience and next year will render better service. It is hoped that they will continue to receive the cordial esteem and respect that is now extended. During the year under review not one questionable or suspicious act occurred in any association. Nor has any accusation been made against any agent, or any officer, or any member of any association.

COÖPERATIVE ORGANIZATION AND COÖPERATIVE MARKETING SECTION.

Status of the section at the beginning of the year.—There were 29 provincial agricultural societies as follows: Albay, Bataan, Batangas, Bohol, Bulacan, Camarines, Capiz, Cavite, Cebu, Ilocos Norte, Ilocos Sur, Iloilo, Laguna, La Union, Leyte, Mindoro, Occidental Negros, Oriental Negros, Nueva Ecija, Palawan, Para-

panga, Pangasinan, Rizal, Samar, Sorsogon, Surigao, Tarlac, Tayabas, and Zambales. Ten of these societies have held elections of new officers for the year 1918. Besides these societies there were 280 municipal agricultural societies, scattered in the above-named provinces. Twenty-three municipal agricultural societies have held new election of officers for the year 1918.

Plan of work.—The work of this section consisted of:

(a) The continuation of the issuing of a weekly market report of Manila prices of staple farm products.

(b) The mailing of the Philippine Farmer free to all members of all agricultural societies, to some employees of the Bureau, to division superintendents of schools, to some supervising teachers and principals, to members of the Philippine Legislature and some foreign agricultural institutions and libraries.

(c) The receipt of a weekly cable of prices on the New York sugar market, the same being repeated promptly by wire to the following sugar producing provinces: Occidental Negros, Oriental Negros, Iloilo, Pampanga, and Batangas.

(d) To extend information concerning the benefits of coöperation and to encourage and assist the forming of coöperative enterprises among the members of the agricultural societies.

(e) Through the organization to bring the farmers and the Bureau of Agriculture in closer touch, thus helping the farmer and increasing the effectiveness of the Bureau.

(f) To establish a communication through this office among the societies with the end of furnishing them a market for the disposal of their surplus products and facilitate a cheaper and easier way of buying merchandise needed for their local consumption.

During the month of April the acting chief visited several municipal agricultural societies at Iloilo and Negros. The societies visited were found to be doing good for the benefit of the farmers. He also visited the Provinces of Bulacan, Cavite, Nueva Ecija, Tayabas, Laguna, and Batangas, to study the conditions of the provincial as well as municipal societies. Most of these associations visited were doing good work, and those which we were indifferent were aroused to an active life by giving them hints and suggestions as to the proper way of undertaking business.

To this office falls the duty of computing the Manila weekly market report issued by this Bureau. In order to obtain data for this report it is necessary to visit several important commercial houses to confer with the managers in regard to prices of the most important crops of the Islands. This report contains

market prices on abaca, maguey or sisal, pacol, sugar, corn, rice, tobacco, and livestock. This is sent to presidents, vice-presidents, and secretary-treasurers of provincial agricultural societies; to Bureau field men, to banks and commercial houses, press in Manila, and several leading fiber concern in foreign countries. The New York price on 96° centrifugal sugar is received by cable from the Bureau of Insular Affairs by the Philippine Government and this is promptly repeated by telegraph to the five leading sugar producing provinces, and to other provinces from time to time by wire when requested. This market report is one of the most important works of the Bureau which has a direct and beneficial results with the farmers of these Islands.

The following will give a brief statement of some of the activities accomplished by the agricultural societies during the year:

The very active president of the agricultural society of Ambos Camarines, Mr. Andres Garchitorena, has undertaken in another way to improve the agricultural conditions of his province. He bought several modern plows and sent them to the different towns for sale at original price. He even suggested to raffle them for ₱0.50 or ₱1. among the small farmers, those who wanted to own a plow but were too poor to buy one. His idea was to let the people become acquainted with the use of a modern plow.

The societies of Mindoro have emphasized the planting of bananas. Lectures in which the importance of the banana as a food was explained were successfully conducted and as result the land to this crop has increased a great deal.

The municipal agricultural society of San Miguel, Bulacan, had made combinations with the teachers and established its activities among the barrios. Lectures had been conducted in the barrio school buildings. Contents of the Philippine Farmer were translated into Tagalog and read in these conferences every month.

The organized associations have been an important factor in the success acquired by the food production campaign. Almost all the societies have taken a keen interest and responded to the call. As a result a big quantity of seed has been distributed throughout these societies. In many cases every individual member of a society started a home garden to supply himself and family.

The provincial agricultural society of Surigao has been active during the year in putting all the uncleared space in the munic-

ipality under cultivation. For this reason, a petition was submitted to the Director of Forestry to the effect that certain provisions of the regulations of the Bureau of Forestry be amended.

The phase of work undertaken by a great number of societies, among them can be cited the municipal agricultural society of Dalaguete, Cebu, was the improvement of both quantity and quality of their crops. Prizes have been offered to encourage the members to extend their cultivation and to use improved methods.

During the year eleven new municipalities were organized. It shows that coöperation is still growing.

INSURANCE SECTION.

History of the insurance section.—Early on the year 1916, Act No. 2573 was passed by the Philippine Legislature providing for the establishment of the Work Animals Insurance under the control and supervision of the Animal Insurance Board, composed of the Director of Agriculture, as chairman, and the Insular Treasurer and one agriculturist, as members, and creating a new section in the central office of the Bureau of Agriculture known as "Insurance section."

This section was not formally inaugurated until the beginning of 1917, subsequent to the amendment of Act No. 2573 by Act No. 2682, providing among other things for the reduction of the number of heads of animals necessary to start with the operation of the insurance, and for the changes in the members of the Insurance Board, to be composed of the Director of Agriculture, as chairman, and two private citizens, one of them acquainted with and interested in agriculture and the other in cattle breeding, as members.

Work of the insurance section.—The work of the former Insurance Board was reduced simply to the holding of a meeting on March 16, 1916, adopting three resolutions on the preliminary steps towards bringing about the enforcement of animal insurance. These resolutions consisted of a request to the Director of Agriculture for the printing of all papers, circulars, blank forms, booklets, etc., and of the fixing of the schedule of values for insuring animals.

As soon as the new board was duly constituted, its first meeting was held May 16, 1917. A resolution was passed adopting and approving the former board's resolutions save the schedule of values which was made entirely ineffective.

The Insurance Board held various meetings during the last year, which meetings dealt mainly with the preparatory steps

with a view to enforcing the insurance law by approving the required papers relative to the management of the insurance society such as the by-laws and regulations governing animal insurance.

On June 25, 1917, the board adopted a resolution providing for the securing of necessary data concerning the local market value of work animals in the leading provinces of the Islands, and the listing of the animal owners desiring to insure their animals when the law is made operative. Accordingly, the two agents were immediately sent out to the provinces to collect data relative to the local market prices of work animals, to confer with the owners thereof as to the advisability of the operation of the Insurance Law, and to list those who might be willing to have their animals insured. These agents visited the provinces of Batangas, Bulacan, Pampanga and Iloilo, the result of their work being the acquisition of sufficient data on the local prices of animals in those provinces, which data were reported to, and presented for, the consideration of the Insurance Board. In the province of Iloilo there has been listed a considerable number of proprietors who are ready to take advantage of the insurance as soon as it is in force.

Judging from the reports of these agents, hardships had to be encountered by them in listing the animal owners, because of the rate of the premiums which the people deem to be so high that they would prefer not to insure their animals rather than to bear an onerous yearly burden constituting a demandable obligation on their part. So they suggested that the rate of the premium be reduced accordingly so as to make it bearable even by the poorest land or animal owners. This suggestion has been made known to the Insurance Board. On the other hand, the sway of the rinderpest prevailing for the entire year in the majority of the provinces was another reason which hindered the enforcement of the insurance society, and unless this calamity is checked there is doubt as to the securing of the minimum number of heads provided for in the law as a necessary condition for its operation.

PLANT INDUSTRY DIVISION.

Progress of work.—With the steady decrease during the year of the technical personnel due to resignations and leave of absences, it has been increasingly difficult to adequately carry on the work of this division and to maintain the former standard of efficiency.

The demands made upon this division are so many and varied that it has been impossible with the limited personnel and funds

available to give the various problems connected with the work, the close supervision and careful study they deserve.

With the establishment of the Philippine Food Commission and the inauguration of an extensive campaign for increased food production, the work of the plant industry division was increased many fold. Through the publicity work of the Food Commission and the work of other agencies the people throughout the Archipelago have been encouraged to establish home gardens and also to increase the planting of all food crops, with the immediate result that the plant industry division has been practically swamped with requests for seed and other plant material. The filling of these requests and the supplying of planting instructions has been no small undertaking and has occupied the attention during the latter part of the year of the limited personnel. It is only by additional competent personnel and by a liberal increase in the funds allotted that this division can efficiently discharge its present manifold duties and enter into broader fields of endeavor. Notwithstanding the handicaps cited above under which the division has labored during the past year the results accomplished have been satisfactory.

A record of the work by projects carried on during the year 1917 follows:

CORN.

All the experimental corn work of the division during the year was carried on at the La Carlota station under the following heads: seed propagation, ear-to-the-row test, variety test, and desert maize.

Two plantings of Moro corn, totaling about 1.6 hectares in area, were made during the year. The first crop was planted during the months of March and was harvested in June, and yielded at the rate of about 1,118 kilos per hectare. The second crop was planted during the latter part of October and was on December 15 showing a vigorous growth. An additional planting of Moro corn was made during the forepart of December.

The ear-to-the-row test consists of a given number of rows each planted with a selected ear of some particular variety. The corn plants are thinned while still young so as to give the remaining choice plants the full benefit of the space necessary for their proper development. In order that cross fertilization may be assured one half of each row, alternating halves, is detasseled, care being used that the detasseling is done before the pollen is ripe. At maturity the corn is harvested and the best individual ears selected for further work along the same lines.

Two consecutive tests were conducted during the year of each of four varieties namely, Cagayan yellow, Cagayan mixed, Loboo yellow and Calamba yellow. One test was made early in the year while the other plantings were made during the months of August and September.

The Loboo yellow variety apparently is resistant to wet weather as was shown by its normal growth and yield during the rainy season. The yields of the other varieties especially the Cagayan mixed variety, however, during the rainy season were much lower than those obtained during the dry season.

Due to the extreme variations in the Cagayan mixed variety very little progress has been made in establishing a pure strain of this variety. As a long series of tests will be necessary before a stable variety can establish from the Cagayan mixed stock, this variety will be eliminated in future tests and the work concentrated on the remaining three varieties which are more promising and which do not present so many difficulties to overcome. Observations in detail have been taken on all the ear-to-the-row tests and are reported fully on in the La Carlota station monthly reports.

Seven strains of desert corn were propagated for forage purposes. Due to force of circumstances the plantings were of necessity made during the rainy season and as the desert maize, as its name would indicate is a dry weather crop, very poor results were obtained. The testing of this maize under more favorable conditions will be conducted next year.

RICE.

Progress of work.—The rice work is carried on under the following headings: General variety test, head-to-the-row test, seed propagation, age of seedling test, good vs. poor field preparation, miscellaneous observations and seed distribution. These phases of the work will be taken up successively and the work accomplished under each heading during the year briefly summarized.

General variety test.—This test is designed to determine the behavior, characteristics and yielding power of the different varieties, with the end in view of selecting the best variety for improvement and propagation. The lowland test made at Alabang, Rizal, includes 165 varieties, 132 of which have been found by previous tests as distinct varieties, while 33 are new ones. Of the total number of varieties 90 are non-bearded, 3 non-bearded and glutinous, 69 bearded, and 3 bearded and glutinous.

Varieties tested last year which behaved differently under

irrigation and showed that they could not be improved, were discarded from this year's test. Samples of these varieties were sent to La Carlota for upland test. Thirteen duplicate varieties have also been discarded from the lowland test at Alabang.

Four Japanese varieties were received from the Bureau of Agriculture of Japan through the courtesy of Mr. Jose Zamora. These seeds were planted at once, but variety Shinriki did not germinate and only a few plants of the other three varieties have grown. They do not seem to be acclimatized to Philippine conditions but some seeds were saved for further trial next year.

The test for upland varieties was done at the La Carlota experiment station where 71 varieties were planted in duplicate plots.

Head-to-the-row test.—This experiment is designed to improve certain varieties of rice selected from the variety test by means of plant selection through the "head-to-the-row" culture. This test consisted of 17 varieties, representing bearded and non-bearded, early, medium and late maturing plants, so as to establish improved varieties to meet all local conditions and requirements.

Seed propagation work.—This is the propagation of improved varieties produced by the head-to-the-row test, for producing selected seeds for sale as well as for coöperative demonstration work. For this purpose all land at the Alabang stock farm assigned to rice work, not occupied by other experiments, was made use of.

In addition to the 193 cavans of lowland seed palay produced at Alabang, for distribution purposes about 150 cavans of lowland seed were also produced this year at the La Carlota station.

The propagation work of upland varieties was done at the La Carlota experiment station. Only one variety, the Inantipolo II, was planted this year as it has given good results under varying conditions of soil and climate. For this work, about 46.59 hectares of land were planted during the year by the tenants on the "share basis" the Bureau furnishing the seed. This system was found to be economical, the seed costing the Bureau practically nothing. The Bureau's share of the Inantipolo seed harvested amounted to about 235 cavans.

Age of seedling test.—This experiment is intended to verify the results obtained in last years' experiment, that—

(1) The earlier the seedling is transplanted, the earlier and greater will be the yield.

(2) The earlier a variety matures, within prescribed limits the earlier it should be transplanted.

(3) The transplanting period varies between 20 and 60 days from sowing, depending upon the variety planted.

In this experiment, 16 varieties representing the earliest and latest varieties and their intermediates were selected. These varieties were arranged in pairs with reference to their maturing periods.

Miscellaneous observations.—An experiment similar to one carried out last year to determine how many men are required to plow a hectare of land in 1 day, was also done this year. From last year's result 7 to 8 men were required to plow a hectare in one day. For this test four men with a carabao and native plow each were engaged this year. The field was in fairly good working condition. Noting carefully the area plowed by each man and computing the area on an 8 hour-day, it was found that each man plowed on an average $\frac{1}{6}$ of a hectare in one day which meant that it would require six men to plow a hectare in 1 day of 8 hours. The variation of results was due to the condition of the soil at the time of plowing.

Due to lack of laborers this year, women were employed for transplanting the rice seedlings. By so doing it was noted that about 40 per cent of the usual expense in connection with transplanting was saved. It was also found that it required about 12 professional women transplanters to plant a hectare in one day.

Seed distribution.—Due to unfavorable weather during the year 1916, a large portion of upland seed rice produced at La Carlota gave a very low germination test and therefore was not used for seed. Most of it was sold as commercial rice and the remainder was turned over to the Animal Husbandry division for use as feed.

The following table gives the total amount of seed distributed during the year:

Sold:	
Upland	cavans 204.5
Lowland	do 363.5
Free, mostly to coöperators thru field men:	
Upland	do 17
Lowland	do 65
Sold as commercial rice (low germination)	do 225
Turned in to animal husbandry division	do 113
Total	do 988

SUGAR.

Progress of work.—The work of the sugar project for the past year has been done along lines of special investigations, research and experimental, and the results thereby obtained have been used in conducting demonstration work among the plantations in both field and factory. This resulted in improving the yield as well as the quality of the sugar. This work has also resulted in the securing of valuable data on the various soils and in factories which is available to promoters desiring to introduce modern equipment to handle the cane. The cane crop this year in the majority of sugar districts has been slightly below normal, due largely to excessive rains during the early part of the growing season. The area under cultivation is possibly a little larger than that of the last year. The hope of better prices for sugar during the next few years has induced some planters to extend the area whenever milling plants were available to handle the extra cane. This is particularly true in the regions of the large factories. A large production of the better classes of sugar was experienced this year in both centrifugal and muscovado than ever before. This was due largely to the fact that the modern factories were operated at full capacity during a longer period than ever before. In the muscovado factories approved methods of tempering or clarifying the juices by the aid of litmus paper as an indicator and the employing of settling apparatus as recommended by the Bureau of Agriculture, have given better juices for concentration with resulting higher grades of sugar than has been produced heretofore.

La Carlota experiment station.—Four hectares of cane were grown at this station for experimental and distribution purposes. Weekly analyses were made of each variety and these data showing the relative value of the cane, are available to planters and sugar manufacturers.

In addition to the laboratory work on cane grown at the station, numerous specimens of cane and samples of sugar house products were received from the various plantations and these analytical results were furnished the planters gratis.

During the first three months, numerous orders were filled for cane points of the Hawaiian and Louisiana striped varieties for the nearby plantations, and in November ten thousand points were sent to San Carlos for use in starting a demonstration station in coöperation with the San Carlos milling company and planters at that place.

Alabang.—Approximately two hectares of plant and ratoon cane were grown at this station for distribution purposes only. During the first three months of the year, the harvesting of the previous crop was finished and the land was prepared for the ratoon crop. The planting of new cane was finished during the forepart of January. The distribution of the new crop was started during the latter part of October. By starting this work early in the year while the cane was yet immature, a greater number of points were obtained than would have been possible after the cane had ripened. The work of distributing cane was interrupted during December due to the fact that no laborers were available to cut the cane and also to the fact that there was no money available for the purchase of sacks for use in shipping the cane. More than eighty thousand points were shipped from this station to the various provinces during the year.

Singalong.—A small plot of land was planted at this station to the first Philippine seedling varieties produced here. Also a row of each of the promising foreign varieties was planted here. This cane was all used for experimental and observation purposes and the points of the foreign varieties were used for distribution to the various planters as it was cut for the analytical experiments.

Lamiao.—Points from Philippine seedling varieties were planted on the small plot near the propagation shed at this station and the cane which develops from this second planting will be used for experimental and observation purposes. All of the Philippine seedling varieties produced during the past year were planted in this same plot as may be observed from the drawing on file in the Lamiao office.

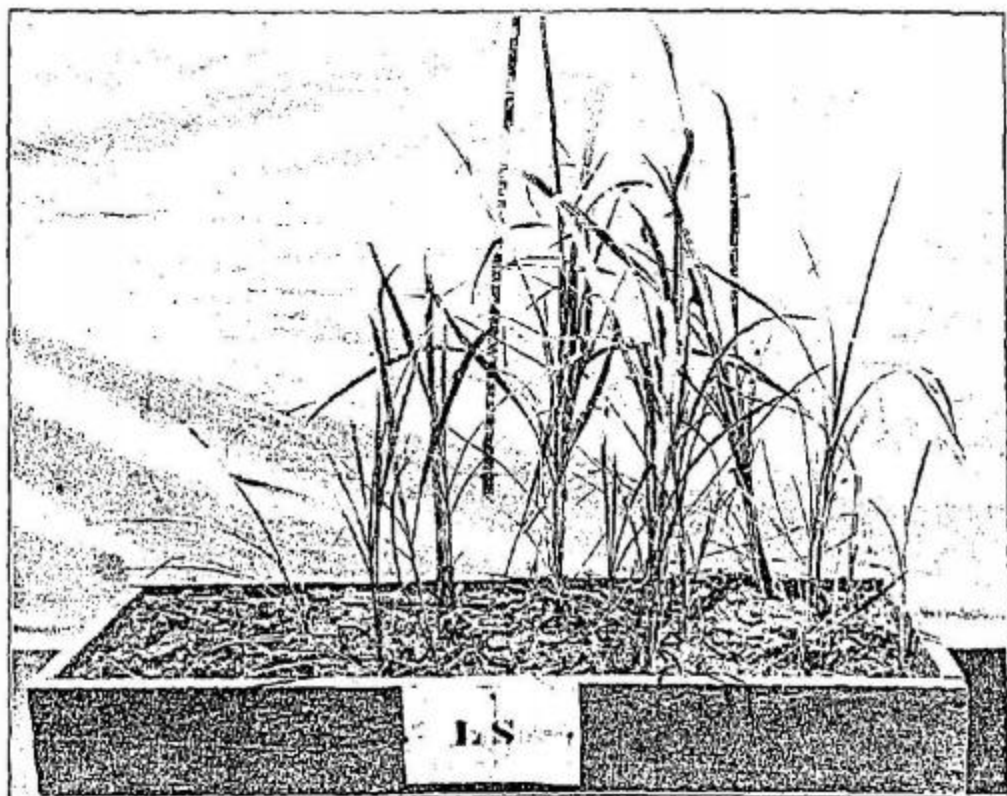
Demonstration stations.—The various demonstration stations conducted during the previous year were continued during the present year and in addition a number of new stations were started.

The one at Pansol, Barrio of Calamba, is being conducted in coöperation with the Philippine Sugar Development Company while the one at San Carlos, Occidental Negros, is being conducted in coöperation with the San Carlos Milling Company.

The technologist made numerous visits to the various plantations and sugar factories where instruction and assistance was given the sugar planter in his plantation and factory work. It is certain that the improvement in the grade of sugar manu-



(a) Maize fertilizer plots. Atabang, Rizal.



(b) Cane produced from seed from Louisiana striped cane gathered at Atabang, Rizal.

facture during the past three years is the result of this practical instruction. The same may be said also of the increased yield of cane and sugar.

FORAGE AND COVER CROPS.

Sorghums.—The Amber Cane and Broom Corn plots which were planted at La Carlota the latter part of last year were harvested and 8.6 kilos and 11.1 kilos of seed respectively were obtained from the two sorghum varieties. New plantings of these sorghums were made during the month of September.

Sweet potatoes.—A small plot of sweet potatoes planted during the early part of the year was pastured to hogs as soon as the roots were ready for harvesting. In order to serve as a cover crop for abaca about $\frac{1}{4}$ of a hectare in abaca field No. 2 was planted to sweet potatoes. Three varieties of sweet potatoes, namely American Large White, Large New Jersey Red, and Momungan were planted in the nursery on a small scale and will later be propagated in large numbers for distribution purposes.

Cowpeas.—About 600 kilos of seed were harvested from plots planted in December of last year. During the months of July and August of this year two plots 1.16 hectares in area were planted for seed propagation. The harvesting of these plots is yet incomplete but about 50 kilos of seed have already been obtained. An additional plot $\frac{1}{4}$ of a hectare in area was planted to cowpeas in September as a cover crop and have made a satisfactory growth.

Patani (Red seeded variety).—This variety of patani was planted in May and has given a good account of itself as a cover crop, effectually smothering out weeds. However, due to heavy rains which damaged the young seed pods the yield of good seed will be small.

Peanuts.—In January a field $1\frac{1}{2}$ hectares in area was planted to the Pondichery variety which yielded 600 kilos of seed. On November 28 another field of 8,536 square meters in area was planted to this variety. A small plot of Chinese peanuts was planted in March but only a small amount of seed was harvested due to the depredations of rats which destroyed the nuts before and after they were matured.

Tahore beans.—The bean was grown on a small scale in the

nursery and showed a very prolific and vigorous growth. In order to further determine its possible value as a cover crop a plot 950 square meters in area was planted during November. The worth of this bean cannot be definitely determined until the present crop has progressed further in its growth.

Guar.—About 12 kilos of seed were harvested from a 0.16-hectare plot planted on January 16. The comparatively low yield was due largely to the damage done to the plants by the excessive rains. An additional plot was planted in October and as the pods will ripen during the dry season, larger yields of seed are anticipated.

Grasses.—The 0.2-hectare plot of Sudan grass planted January 8 was harvested in June and produced 16.4 kilos of seed. A second crop of 13.14 kilos of seed was harvested in September. A second cutting of the plants was made in October. The fields of Guinea and Para grass were cut regularly during the year for animal feed. The paspalm grass grown for seed production made a very poor growth and no seed was produced. The Japanese forage cane made excellent growth during the year and was cut regularly to supplement the other grasses fed to the work animals.

TOBACCO.

At Dammao, Isabela Province it was originally planned to grow 120,000 plants for the 1917 tobacco crop but, owing to irregularities on the part of three families who were subsequently dismissed from the station during the cultivation months of February and March, only 70,000 plants grew to harvest time. The appearance of fungus and land snails on the seed beds and irregular weather conditions when the seedlings were still on the flats and in the beds also effected the station seedling supply.

The foreign varieties tested for acclimatization were Vuelta Abajo (Cuban) Texas Cuban, Connecticut Havana and Tirona Hybrid a cross between Cagayan and Connecticut Havana. The seed of all these were furnished by the College of Agriculture thru the courtesy of Prof. Chas. F. Baker, head of the department of agronomy, University of the Philippines. These varieties were grown in separate plots. The following were the results obtained in the first year of acclimatization of these varieties: Vuelta Abajo although exhibiting the genuine charac-



Tobacco, Viscaya type, grown near Hagan, Isabela.

teristics of a good wrapper tobacco did not grow to its normal size. Texas Cuban did not show fine veins. Connecticut Havana had too uneven and gummy leaf surface for wrapper. Tirona Hybrid was likewise too gummy for wrapper. The experiment was not at all promising, but until the seed becomes fully acclimatized to the locality it is hard to tell how the resulting plants turn out.

Selection of the foreign varieties was not so difficult as they exhibited more or less uniform characteristics, Tirona hybrid, however, was very irregular so that only the individual plants which showed wrapper qualities were saved and the rest discarded.

Permanent improvements.—During the year the following permanent improvements were accomplished:

Tobacco Warehouse, built of strong material, nipa roof, 10 meters wide by 18 meter long by 3½ meters high to the eaves, built for the purpose of curing the station tobacco crop and has a capacity of storing at least 500 three quintal bales of tobacco.

Superintendent's house, built of strong material. The house is 9 meters wide by 14 meters long by 3 meters to the eaves, three rooms with surrounding porch on three sides, can be arranged to accommodate 12 visitors. A kitchen with iron roof attached also built of strong material.

Five drying sheds as per specification of the Bureau of Agriculture, 12 meters long by 6 meters wide by 3 meters to the eaves, built of Tarao hariguez, bamboo sides and cogon roof.

Seven family dwelling houses, Government furnished material such as bamboo, bejuco, and part of the posts.

In addition to the above improvements ₱815.29 was paid to laborers during the year. They were engaged in clearing land for building sites, building culverts, roads and a river landing place at Dammao.

Seed beds for 1918 crop.—The work on seed beds for the 1918 crop was commenced during September 1917. Aside from the sowing of the selected foreign varieties, there were also five main local types including (1) Broad leaf (2) Espada (3) Medium A Repollo (4) Medium B resembling type 3, and (5) Romero (naked petiole). The excessive rains during November and December played havoc with our seed beds destroying more than half of the seedlings.

SEED DISTRIBUTION.

List of seeds distributed from January 1, 1917, to December 31, 1917.

Name of seed.	Amount distributed		Approximate cost.	Retail Value.	Amount on hand January 2, 1918.
	Kilos.	Packages.			
Ampalaya	.7	100	.40	10.00	None.
Bean, Boston M.					77 kilos.
Bean, C. W.	1,208	173,950	797.28	17,395.00	None.
Bean, Cadys	10	1,440	5.00	244.00	Do.
Bean, Ky. W.	2,457	353,808	1,621.62	35,380.80	1,271 kilos.
Bean, Lima	599	86,112	556.00	8,611.20	None.
Bean, Lyon	83	2,888	16.00	298.80	1 kilo.
Bean, M.W.W.	2,555.5	369,576	2,429.83	36,957.60	969 kilos.
Beet	327	94,176	1,041.20	9,417.70	266 kilos.
Cabbage	204.5	117,793	2,584.44	11,779.20	6.5 kilos.
Carrot	138.5	79,776	627.22	7,977.60	148 kilos.
Condol	.2	28	2.00	2.60	0.5 kilo.
Cucumber	184.5	63,136	505.53	5,313.60	45 kilos.
Eggplant	15.8	9,184	286.80	918.40	None.
Endive	84	48,678	285.60	4,867.60	3 kilos.
Kale	16.5	9,501	48.94	950.40	None.
Kinchay	52	30,952	208.00	3,095.20	5 kilos.
Kohlrabi	3	768	9.00	76.80	None.
Lettuce	156	82,352	530.40	8,235.20	58 kilos.
Melon	5	2,880	12.50	288.00	None.
Muskmelon	47.75	14,040	119.50	1,404.00	47 kilos.
Mustard	499	286,824	1,846.30	28,682.40	45 kilos.
Okra	134.5	37,080	259.17	3,708.00	0.4 kilos.
Onion	86.3	42,696	483.28	4,969.60	50 kilos.
Onion sets A.B.					47 kilos.
Papaya	17	4,684	169.00	468.40	0.8 kilos.
Parsley	.6	288	1.04	28.80	None.
Peas Chinese	203	7,740	400.00	774.00	Do.
Peas Yorkshire	274.5	10,356	161.08	1,035.00	Do.
Pechay	518	298,368	1,813.00	29,836.80	34 kilos.
Pepper	150	86,688	1,755.84	8,668.80	0.5 kilo.
Pumpkin	239	34,416	525.96	3,441.60	42 kilos.
Radish Chinese	597.5	172,080	418.25	17,208.00	27.5 kilos.
Radish F. Break	4.5	1,296	63.90	129.60	None.
Roselle	33.5	16,704	33.50	1,670.40	1 kilo.
Rutabaga	123.75	71,280	616.87	7,128.00	10.5 kilos.
Seguidillas	15.5	2,232	13.50	223.20	11 kilos.
Spinach	.5	288	1.16	28.80	None.
Soy bean					85 kilos.
Squash	358	61,552	667.88	5,155.20	22 kilos.
Tomato	154.5	83,992	1,029.10	8,899.20	71.5 kilos.
Turnip	179.5	103,492	603.04	10,349.20	37 kilos.
Uansoy	46.5	13,392	1,339.20	1,339.20	6 kilos.
Watermelon	373.5	57,606	694.71	5,730.60	187.4 kilos.
Bean, castor oil	18,492	Sent in bulk.	3,970.80	3,970.80	5,600 kilos.
Bean, Patani	673	do	134.60	134.60	171 kilos.
Coffee, Abeocuta	17	do	102.00	102.00	None.
Coffee, Canephora	11.5	do	69.00	69.00	Do.
Coffee, Bukobensis	1	do	6.00	6.00	Do.
Coffee, Excelsa	29.5	do	177.00	177.00	Do.
Coffee, Liberia	3.6	do	21.00	21.00	Do.
Coffee, Quillou	19	do	114.00	114.00	Do.
Coffee, Robusta	85.5	do	513.00	513.00	Do.
Coffee, Uganda	17.5	do	105.00	105.00	Do.
Corn, Moro	4,001	do	355.84	355.84	15 kilos.
Corn, Nat. yellow	5,476	do	472.64	472.64	171 kilos.
Corn, Mex. June	216	do	19.44	12.10	12 kilos.
Cowpeas, Black	250	do	60.00	60.00	None.
Cowpeas, N. Era	2,274	do	508.00	508.00	3.5 kilos.
Indigo	5	do	5.00	5.00	None.
Ipil-ipli	68	do	5.80	5.80	Do.
Lumbang Bato	120	do	17.00	17.00	Do.
Lumbang Banucalao	522	do	40.00	40.00	100 kilos.
Mongo, Nat. yellow	908	do	128.00	128.00	None.
Onion sets	300	do	120.00	120.00	Do.
Palay, lowland	18,463	do	1,602.81	1,602.81	Do.
Palay, upland	9,530	do	775.67	775.67	Do.
Peanuts	2,093	do	438.00	438.00	92 kilos.
Potatoes	1,710	do	268.00	268.00	None.
Sorghum	8	do	2.00	2.00	Do.
Tobacco	76.0	do	152.00	152.00	29 kilos.
Total	77,527.5	2,931,894	34,044.48	303,262.46	9,775.60 kilos.

LA CARLOTA EXPERIMENT STATION.

Permanent improvements.—The following buildings were erected during the year: One hog house 8.2 meters long by 4.2 meters wide and 3.5 meters high, with cement floor and iron roof, one poultry house consisting of four pens, each measuring 18 feet square, and one cattle shed 12 meters long, 9.5 meters wide, and 5.9 meters high. Aside from the above construction work considerable repair work was done on various station buildings. The foreman's house is in such a dilapidated condition that it is impracticable and it is, therefore, recommended that a new structure of light materials costing about ₱200 be built to replace the old house. During the past year the Bureau of Public Works extended the main road about 2 kilometers in the direction of the barrio of Huguinit. The various roads within the station have been repaired from time to time as needed. One-half kilometer of wire fencing with concrete posts was constructed during the year. The telephone line between the station and the town of La Carlota was repaired as occasion demanded.

Weather conditions.—The rainfall throughout the entire year was exceptionally heavy and considerable damage was done to growing crops owing to the adverse weather conditions. The rice and corn crops suffered especially from the heavy rains.

Progress of work.—The work of the plant industry division at the La Carlota station is carried on under the rice, corn, sugar cane and forage and cover crop projects and is reported on under these projects.

SINGALONG STATION.

Equipment.—The equipment of the station has remained practically the same throughout the year. The present condition, however, of most of the small implements, hoes, rakes, shovels, etc., and of the field implements, is very poor and the replacing of most of this equipment will be necessary during the ensuing year.

Bananas.—Due to the continual digging of suckers in order to supply numerous requests therefor the banana plantation has suffered somewhat. Five varieties of bananas were under test namely, Bungulan, Gloria or Tarnate, Lacatan, Latundan and Saba.

Cotton.—The two rows of Caravonica cotton planted last year were fertilized with acid phosphate, potassium sulphate and sodium nitrate. The plants responded noticeably to this treatment

and have made a very satisfactory growth. The sea island cotton made an unsatisfactory growth and was cut down.

Forage crops.—The guinea grass field was harvested four times during the year and the grass used as a feed for the station animals. A considerable number of stools of this grass was also distributed in compliance with various requests received during the year.

Root crops.—The old sweet potato field containing nine varieties of sweet potatoes was maintained during the year and furnished about 14,000 cuttings for distribution purposes.

Nursery.—An important phase of the station work was conducted under this project and consisted mainly in making of seed boxes, planting seed, transplanting seedlings in bamboo tubes and in the outside nursery and in packing seeds and plants for distribution. During the year, 688,709 various kinds of economic plants, cuttings, bulbils, and suckers, and 9,236 ornamental plants and cuttings, etc., were distributed from the station.

LAMAO EXPERIMENT STATION.

Buildings.—The buildings are the following: Residence, office, propagation-shed, barn, compostpit, enginehouse, launchhouse and the beehouse. The residence of the superintendent and the office were both constructed with light materials and nipa roofings. They cover an area of 149.5 and 176.6 square meters respectively. The propagation-shed covering 485.44 square meters in area built with frame structure of hardwood is used as propagation-shed, packing shed, seed bodega, tool bodega, and part of which is used to keep the fertilizers and for the drying of seeds where the canvas frames were placed. The barn and compostpit covering an area of 63.84 and 87.04 square meters respectively were built with hardwood structure, iron roofings and cement floors. Two small houses, one covers an area of 36 square meters and the other 12.6 square meters were built with frame structure and iron roofings. These houses are served to shelter the launch and the engine. The buildings enumerated above including the beehouse are all in good conditions except the adjoining bodega of the office and part of the nipa roofing and walls of the residence. The bodega needs an entire repair as soon as funds are available.

Improvements and repairs.—The improvements made during the year consisted in clearing two pieces of land, measuring about 1.5 and 1.7 hectares respectively. The former was opened

the latter part of last year (1916), and it is planted now with three varieties of coffee, namely Abeocuta, Excelsa and Liberian. Two more tropical fruit orchards, one Annona orchard, and the extension of Citrus grove on field "N" were established during the year.

The bamboo-shed constructed last year which covers 1917.3 square meters of ground was entirely rebuilt during the year.

The floor of the office was repaired from time to time. The roof of the propagation-shed was painted with coal tar outside and with Chinese chalk inside. The posts of the office and part of the front wooden fence were also painted with carbolineum. The purpose of the carbolineum and coal tar beside to protect the attack of the white ants was to increase the durability of the parts painted. The Chinese chalk is to give more light to the young seedlings in the propagating-shed.

The bearing of the launch was broken last September, and it was sent to Manila for repair. Now it is in good working order again. New ties and fishplates were put out on the truck of the launch.

The soil and the cement dams were once repaired during the early part of the year. After the repairs were made the supply of water was sufficient throughout the dry season.

Progress of work.—The work at the Lamao experiment station is carried on under the following projects: Tropical fruits, citrus fruits, pineapples, avocados, papayas, mangos, coffee nursery, and plant distribution, root crops, vegetables, seed growing maintenance and extension. These phases of the work will be taken up successively and the work accomplished under each project during the year briefly summarized.

Tropical fruits.—The object of this project is to assemble and establish in permanent orchards all tropical fruits found in the Philippines, to introduce a large number of foreign tropical fruits, to select and breed those species that have already been established, and finally to vegetatively propagate the different species especially by shield budding.

During the year 254 of various tropical trees have been planted in permanent orchards in fields H and I, besides the 180 Annonaceous plants that were also planted in the test rows of the above-mentioned fields, and in field J. There are now three orchards of tropical fruits and two of annona. The tropical orchards are fields F, H and I, and the annona fields are J and M.

Citrus fruits.—Three hundred thirty-three budded citrus trees were added to in orchards A, B, C, and N during the year.

Twenty seedlings of 5 lots were also planted in fields N and O. The 333 budded trees that were set out include 217 citrus hybrids obtained from the U. S. Department of Agriculture, Washington, D. C., and 116 are both native and introduced varieties. There are now 154 budded citrus trees in orchard "A," 134 in "B," 134 in "C," and 208 citrus hybrids and 128 unbudded trees in orchard "N" and 320 unbudded trees in "O."

Pineapples.—There are now 1,633 Queen, 2,656 Cayenne, and 1,255 Spanish planted among the avocado orchard, 195 Hybrids in Citrus orchard "B" and 104 Sugarloaf in Citrus orchard "C." The work on this project was confined largely to cultivation and irrigation of the old pineapples plantation set out late in 1915. The pineapple plants have set but few fruits this year. We hope to distribute pineapple suckers this coming year as far as they are available but not to destroy the plantation as was done during the previous years.

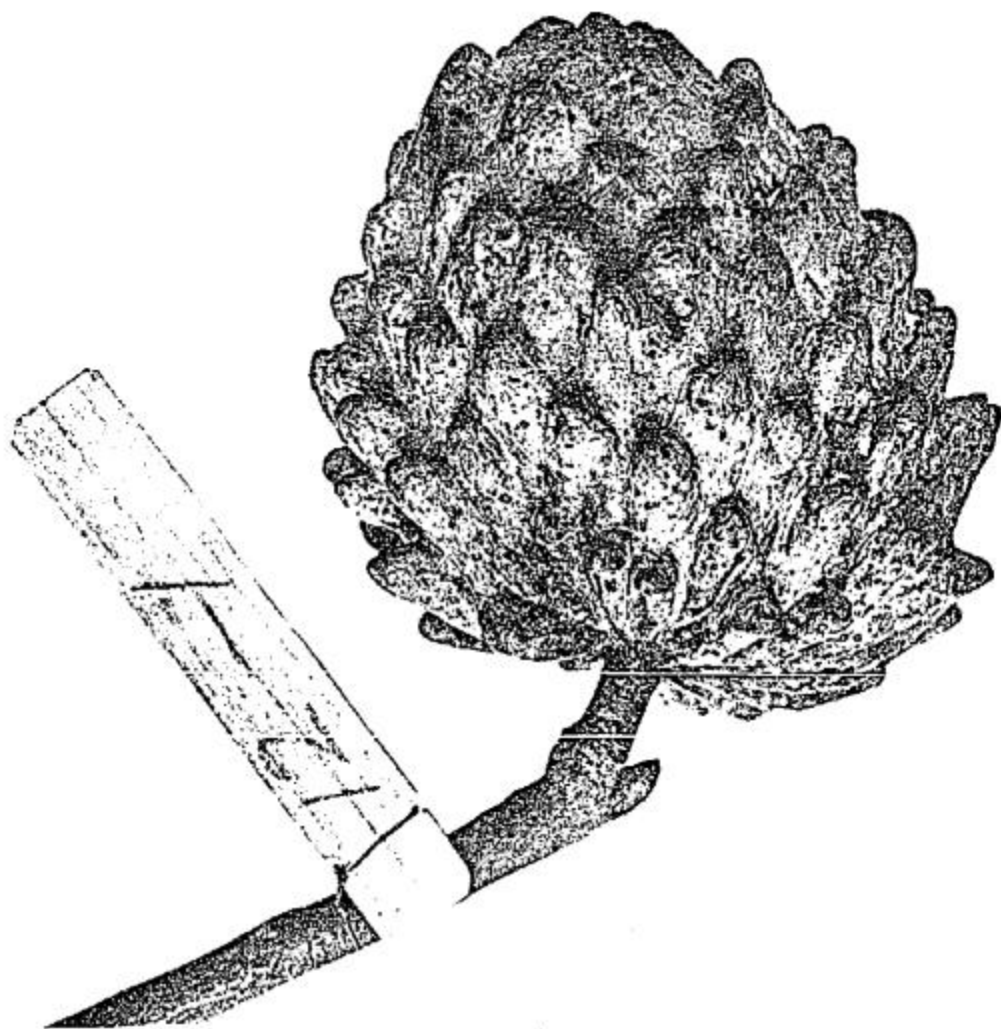
Avocados.—The old avocado trees have fruited earlier this year than the former years. Several fruits have been harvested and seeds of which were planted for stocks. Two varieties of the budded avocados in the orchard were observed in bloom but produced no fruits.

Budsticks of 23 varieties of avocados have been received from the Bureau of Plant Industry, Washington, D. C. Sixteen out of these were received in good conditions, and budded successfully. Due to the fungus which usually caused the die-back of the avocados especially young growing plants, three out of sixteen died.

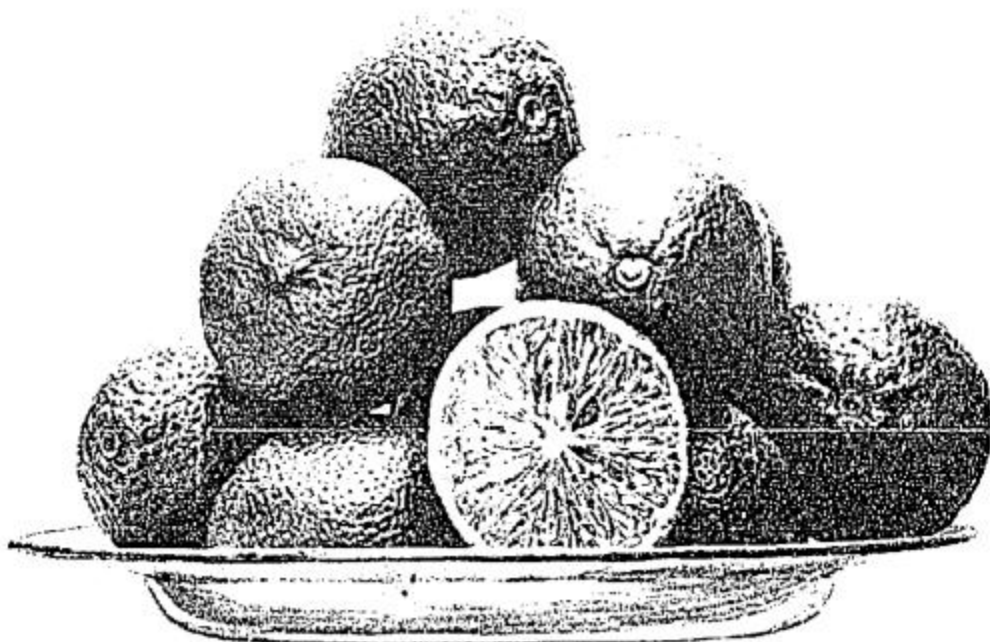
The avocados in the nursery both budded and seedlings were very badly attacked by the die-back fungus during the rainy days. By spraying with Bordeaux mixture, (0.8-8-100) and given them plenty of light they are now recovering and setting new leaves.

Papayas.—Three orchards of papaya have been maintained at Lamao for seed production. These are interplanted with the citrus orchards A, B, and C. In all there are now 188 papaya trees and out of these plants 102 were newly planted in orchard C. The papaya trees in orchard B are getting too old and small fruits are obtained so sooner or later these papayas will be chopped down.

Mangos.—The mango collection now at Lamao included the following varieties: Surkha, Chickna, Stalkari, Kachamitha, Kakaria, Nijibabadi Amin, Sufaida, Malda, Krishna Bhog, Tamancha, Salibunda, Bombay yellow, Gopalbhog, Gelee, Cam-



(a) Philippine Islands No. 12 Atemoya. (*annona glabra* X *A squamosa*).



(b) Ripe Lemon, supposed to be Libsen variety, Lanan Experiment Station, Lanan, Bataan.

bodiana, Geding, Bombay green, Paho, Skrikhas, Biscea mukha, Juani, Davy's favorite, Naspoti, Kutna, Langra, Alfonso, Sandura, Singia, *Mangifera indica* var. *M. mekuginensis* and 4827.

Previous to the month of May, 1917, no separate expenses have been charged from this project due to the fact that the mangos were all either in the nursery or interplanted among the temporary rows of the tropical arboretum. But last May a separate orchard devoted exclusively to mangos has been established in the old guava field. Thirty inarched mangos have been transplanted which includes Surkha, Sharbati black, Chickna, Stalkari, Kachamitha, Kakaria, Najibabadi Amin, Su-faida, Malda, Drishma Bhog, Tamancha, Salibunda, Bombay yellow, Gopalbhog, Gelee, Cambodiana, Geding, *M. mekuginensis*, and No. 4827. All are alive and making progress except Sharbati black. The remaining mangos in the temporary rows of the tropical arboretum will also be transplanted in the mango orchard as soon as time permits.

Coffee. The object of planting coffee at Lamao is to demonstrate modern methods of growing coffee, to provide future seeds for distribution, and finally to provide data as to the actual cost of maintaining a piece of coffee land.

The 150 Excelsa plants set out last year are making good progress and the 70 Liberian were nearly all dead, which is probably due to small size when planted and to the lack of shade in advance before planting the seedling. All dead Liberian were also replaced during this year. Few plants of the Excelsa are now beginning to set flower buds.

The new coffee lands in field "P" have been planted to 87 Abeocuta, 79 Liberian and 66 Excelsa coffee last July. All of them are making a good start.

Nursery.—This project is so far the most important project carried out in this station. The work consists mainly of seed and plant propagation, the packing of plants for distribution, the cutting or sawing of bamboos for tubes, the making of shipping boxes, the hauling of soil and gravel and the composting of soil.

Plant and seed distribution.—Six thousand six hundred and seventy-six tropical fruit trees of various species, 41,005 coffee seedlings representing 10 varieties, 350 pineapple slips, 1959 ornamental plants of various kinds, 108,447 various plants and cuttings and 1762.89 kilos of seed including, corn, various legumes, coffee, etc., were distributed from the Station during the year.

Vegetables.—No definite work has been done on this project

except the growing of Lima beans, Seguidillas, Curuba and the two varieties of Libato for seeds production. These crops with the exception of the Libato were cultivated mostly as cover crops.

Root crops.—The work on this project was confined to the growing of various varieties of yams, 3 varieties of sweet potato (Red New Jersey, Momungan and American large white) and 3 varieties of cassava obtained from Java by Mr. P. J. Wester. Six hundred cuttings of each of the sweet potatoes named above were planted, and 252 square meters of ground to cassava in field "N" among the Citrus hybrids.

PEST CONTROL SECTION.

The locust campaign.—It is with pleasure that it can be announced that the Islands are now free from the grip of locusts. It may be safely said that during the present year, there has been no damage to agricultural crops by this pest. On July 28, 1917, the Archipelago was declared free of locusts, and, except for three straggling bands that have been destroyed upon their appearance, the Islands have been free ever since. Since September 22, 1917, no known locust swarms existed in the Archipelago, a statement that could be made for the first time since the earliest settlement of the Islands.

With the eradication of the locust pest, the work of the office in locust control has by no means ceased. The time of locust inspectors has been devoted to organizing the work in the municipalities in order that possible future swarms may be summarily dealt with immediately upon their appearance.

As a part of this organization, all locust fighting equipment is being gone over and being put into shape for immediate use in case of emergency. Another phase of the organization work consists in the Bureau furnishing a report of the locust conditions throughout the Archipelago to every provincial governor. By this means each governor can see at a glance just what the locust situation is in each province and any possible invasion may be readily anticipated.

During the fiscal year of 1916 funds in the amount of ₱14,850 were allotted to provinces for assistance in controlling locusts. During the present year it has been necessary to allot only ₱11,200, much of which has been made as a measure of precaution and remains unspent. The major portion of the amount expended has been used in the control of the pest in the uninhabited public domain and used for the feeding of laborers. The diminution of the amounts utilized this year as compared



Liberian coffee grown at Linao Experiment Station, Linao, Batan.

with those of preceding years is due to two reasons: (1) Organization of the work and (2) scarcity of the pest. Despite the small amounts allotted every province shows a healthy balance of locust funds which aggregate over ₱40,000.

Work of the provinces. While most of the provinces have rendered excellent service and handled their campaigns with little or no assistance or supervision, the diminution of the size and number of locust swarms has produced a tendency on the part of some provinces to slack up on the discipline which, if allowed, will undo all of the good work that has been accomplished

by that particular province. In fact it may be said that the final clearing of central Luzon was made possible solely to the stand taken by Insular officials, the Constabulary and the Bureau of Agriculture, with the aid and pressure exerted upon local officials by the Executive Bureau. Of all provinces invaded by locusts, Bukidnon probably suffers more than any other. This is due largely to the scarcity of population and the vast areas of uninhabited land. These lands are practically all overgrown with high grass which makes ideal breeding grounds for locusts. . . Despite the fact that everything is against them, the Bukidnons are the most persistent locust fighters in the Archipelago. During locust invasion they work seven days in the week cheerfully and without a murmur. Their splendid organization is due to the confidence which they have in the governor, the Honorable M. Fortich.

With the locust at present under control, the country is in a better position to remain free from its depredations than ever. However, it has been definitely proven that freedom from locusts can be purchased only at the price of eternal vigilance. One swarm allowed to develop and become distributed will largely undo results accomplished by the entire campaign. This fact should be firmly inculcated in the minds of all officials connected with locust eradication. Furthermore, it should be made a sufficient cause for strong disciplinary action for any local official to allow locusts to develop wings within the jurisdiction of his municipality.

Work in the investigation of pests and diseases of the coconut palm.—During the latter part of the present year, the work of the inspection of coconut groves has been by far the most important of the various activities under the entomologist. With the passing of the locusts, the work of extending and organizing coconut grove inspection work was taken up. The funds available for locust control were diverted to assist the different provinces in this work. While at first budrot eradication was the

only object of this inspection, it has been found advantageous to extend the work to include those two primary pests of coconut palms, the *Rhinoceros beetle* and the *Palm weevil*.

With the funds available for assisting the provinces, it has been possible to extend the work in question so that in addition to the Insular forces available for this work there are also large forces of provincial workers in Laguna, Tayabas and the Department of Mindanao and Sulu. Funds have been allotted to each province as set forth in the previous tabulation relating to finances.

In order to make for the greatest efficiency, the provincial inspectors are placed under Insular supervision. The results obtained have been most gratifying during the year, it having been possible to inspect 8,661,380 trees. As the work has progressed, new innovations have been constant and have resulted in the establishment of a most excellent system of control.

Taken as a whole, the work of coconut inspection has yielded most positive results which are very far-reaching and which conclusively show the deplorable condition which the coconut industry is in. Among the features which this inspection has brought out are: (1) That the statistics furnished by the local officials are not only erroneous but misleading as the number of trees reported is much less than that which actually exists, generally being 10 to 50 per cent underestimated; and (2) the statistics also show that the actual production of the groves is considerably less than that reported by the local officials. It is estimated that due to the rhinoceros beetle alone the annual loss from trees killed is over ₱6,000,000, while the damage wrought by the two palm weevils, *Rhynchophorus pascha* and *R. pascha* amounts to ₱4,000,000. In addition to the loss incident to these pests may be added the toll taken by rats, crows, wild hogs, budrot and a host of other lesser pests.

The budrot survey work has been continued as set forth in the Annual Report for 1916 and for the year 1917 an inspection of trees aggregating 8,661,318 individuals has been added. The results of these inspections tend to confirm the belief that the disease is more or less confined to certain local areas of infection, where the climate conditions are favorable to the propagation of the disease, and that these local areas are mostly in sheltered valleys where there is a high relative humidity. While this branch of investigation is by no means complete, it is believed from what is known that the infected areas occur largely in such locations. A careful study of the precipitation throughout the various localities seems to point to the fact that the amount of

rainfall has little or no effect upon the prevalence of the disease as it has been ascertained that areas in which the same rainfall prevails month for month throughout the year show some cases a high percentage of diseased trees while other areas with the same precipitation will be almost without a diseased tree.

Comprehensive investigations of plantings at different altitudes in which units of holdings aggregated over 2,000,000 trees planted under all altitudinal conditions, from sea level to 2,200 feet, the altitudinal limit of coconut cultivation, points also to the fact that the disease may be expected with equal frequency in all districts throughout the altitudinal range of cultivation.

Research relative to the pathogenic organism.—In conjunction with Mr. Otto Reinking, plant pathologist of the College of Agriculture, investigations have been continued. In this connection, the work of the office has largely been of collaboration, this office furnishing the material and doing the field work while Mr. Reinking has done the actual laboratory work. While the results have not yet been published, it has been definitely ascertained that the agent responsible for the disease is *Bacillus coli*. This is interesting as there has been a long standing difference of opinion between the pathologists of the new world and those of the old world, as to the exact agent responsible for the disease. In this connection, those of the new world who had worked with the disease maintained that *B. coli* was the cause of the disease. These statements were met by those of the old world that regardless of the results obtained in Cuba and other parts of the new world tropics, the disease known as budrot which occurred in the old world tropics was caused by the fungus *Pythium palmivorum* and that there must be more than one kind of budrot of coconut palms caused by different organism but of analogous symptoms. Thus, the work of the Bureau has in a large measure helped to bring out the fact that the disease in both places is the same and subject to the same control methods.

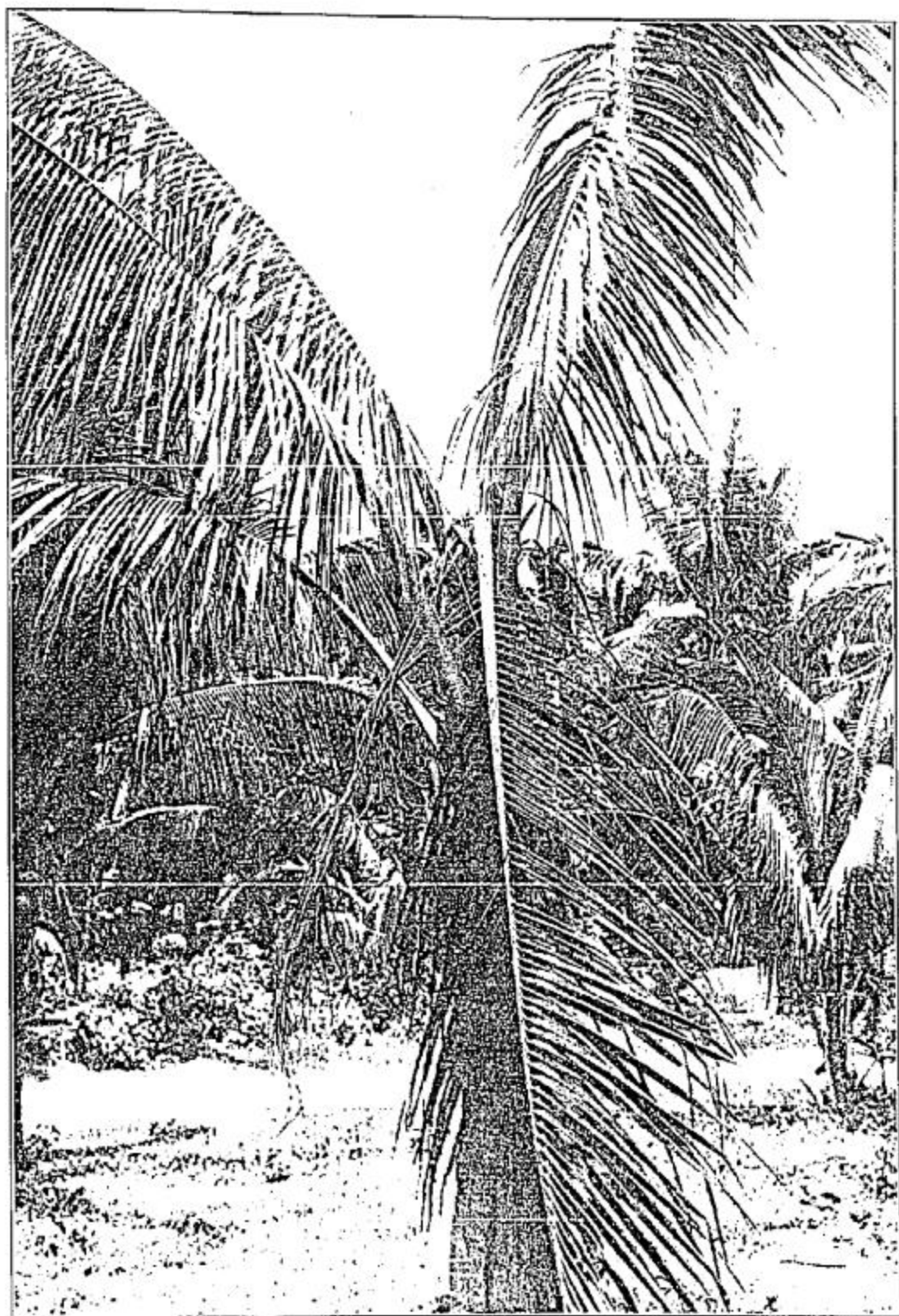
The role of insects in the distribution of budrot.—Investigations mentioned in the report of 1916 relative to the role insects play in the distribution of the disease has progressed, the amount of data collected being added to each week. Just what conclusion will ultimately be arrived at, it is now impossible to state though present knowledge seems to indicate that the adult palm weevils, *R. pascha* and *R. ferrugineus* are persistent feeders on the diseased trees and may be responsible for the local distribution but is not however a determining factor in its prevalence.

A synopsis of the different pests attacking the coconut palms.—Of the different pests attacking the coconut palm the *Rhinoceros*

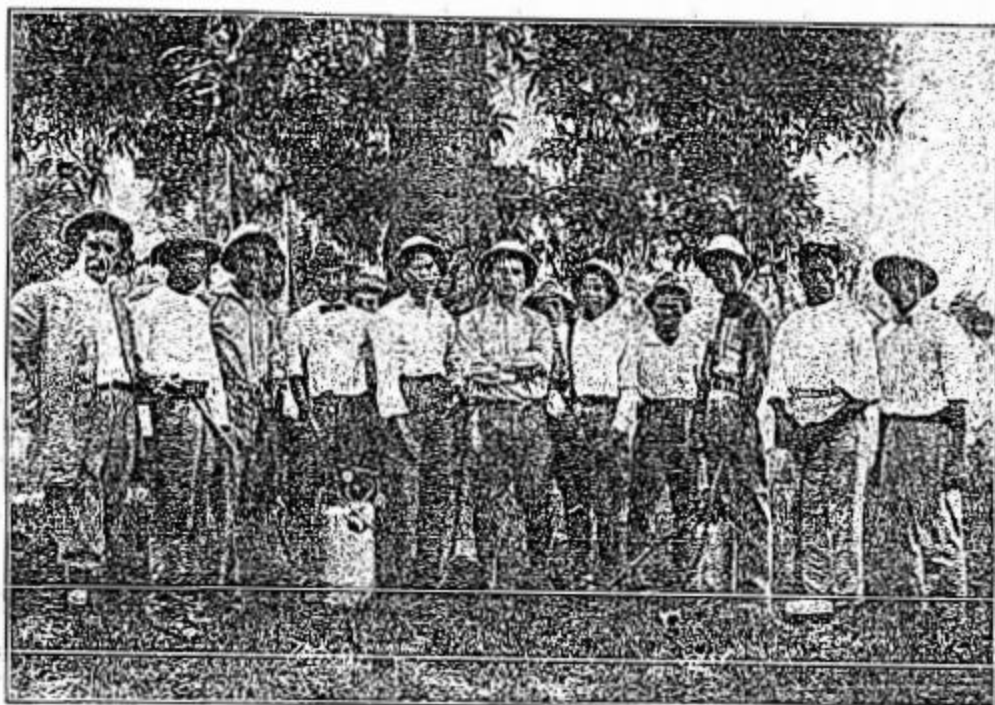
beetle, *Oryctes rhinoceros* still continue to outrank all others as the most destructive. During the year the research work in regard to the life history and investigations as to the extent of the damage caused by its uncontrolled activities have been completed and the whole prepared in a manuscript which is now in the press. In brief, they have brought out the fact that the losses in trees killed outright or fatally injured by its attacks amount to over ₱7,000,000 annually, placing the value of each tree at the very conservative figure of ₱5, a loss which while truly appalling does not begin to represent the total losses to the coconut industry from insect pests.

Scarcely less important than the foregoing pests are the palm weevils, *R. pascha* and *R. ferrugineus*. Inspections for the year show that trees are annually killed and injured by the depredations of these pests and cause a loss of ₱7,000,000 annually. While probably no more numerous this year than in previous years, the damage caused by their presence seems to be much larger due to the previous misconception of potentiality. Reports of damages by other pests of coconuts have been few and the invasion of the groves by *Aleyrodicus destructor* seems to have passed, the present year bringing no report of loss from this species. The "pagui-pagui," *Thosca cinereamarginata* has been present in the groves at Zamboanga and while causing some loss by defoliating the palms it has been present in substantially fewer number than during preceding years.

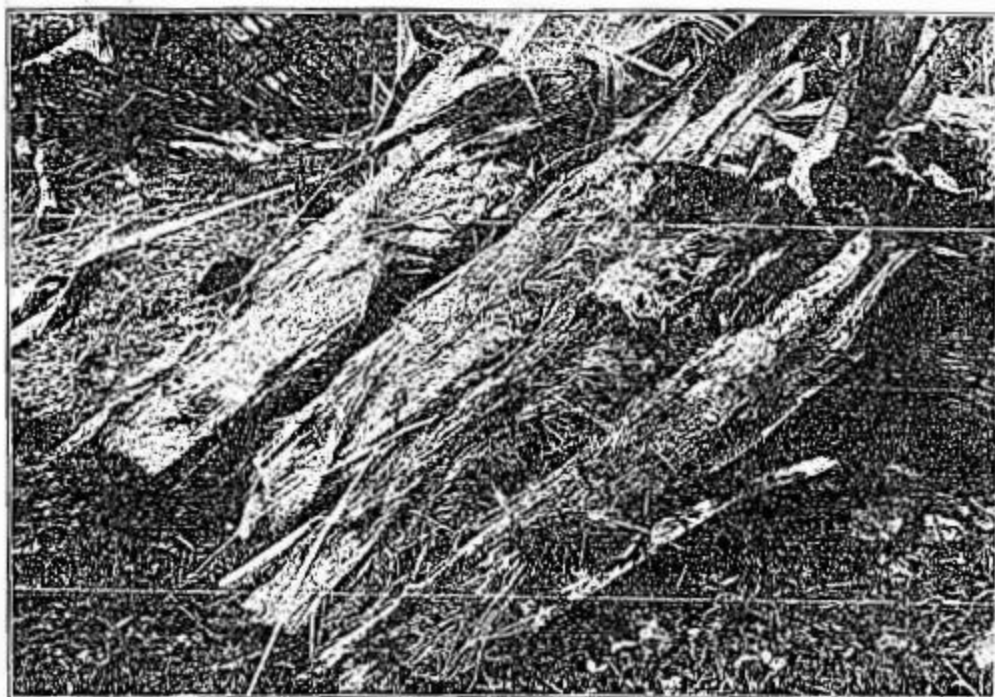
The work on coconuts has proven of inestimable value not only as an object lesson to the planters but to the Government itself. Aside from the actual pecuniary benefits obtained in preventing the spread of pests and diseases and in curtailing the damage wrought by them, other benefits are being realized. First, among these that may be mentioned is the appreciation which is slowly being developed in the planters mind of the Government's attempt to help them and which is being reflected in the more active coöperation which they extend to the Bureau's inspectors and by the large number of requests from municipalities and provinces to have their coconut lands inspected. While there is no financial gain to the Government, this work has shown the deplorable condition of the coconut industry and the great need of legislative measures to correct the many shortcomings of the present system of culture and of marketing the crop. It is a fact that few will believe but which will be substantiated by investigation that the exports of coconut products of the Philippines could be doubled by the adoption of a few simple changes in the methods of cultivation and of marketing the crop.



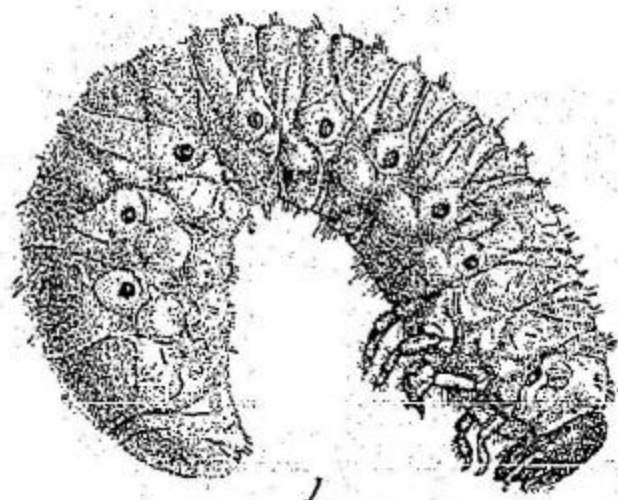
One typical case of budrot. Note the central frond.



(a) A group of Budrot inspectors.



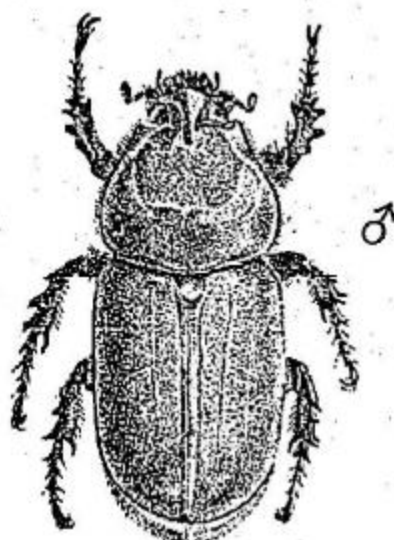
(b) Showing the way how budrot case is prepared for distribution. The pieces are then burned by either dry leaves and sticks or by a fundry torch.



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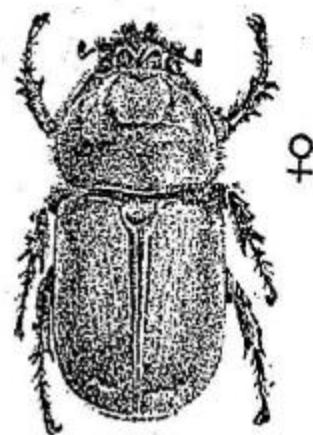


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FIG. 1. Larva.
2. Pupa.

FIG. 3. Adult male.
4. Adult female.

(a) "*Oryctes Rhinoceros*" L.

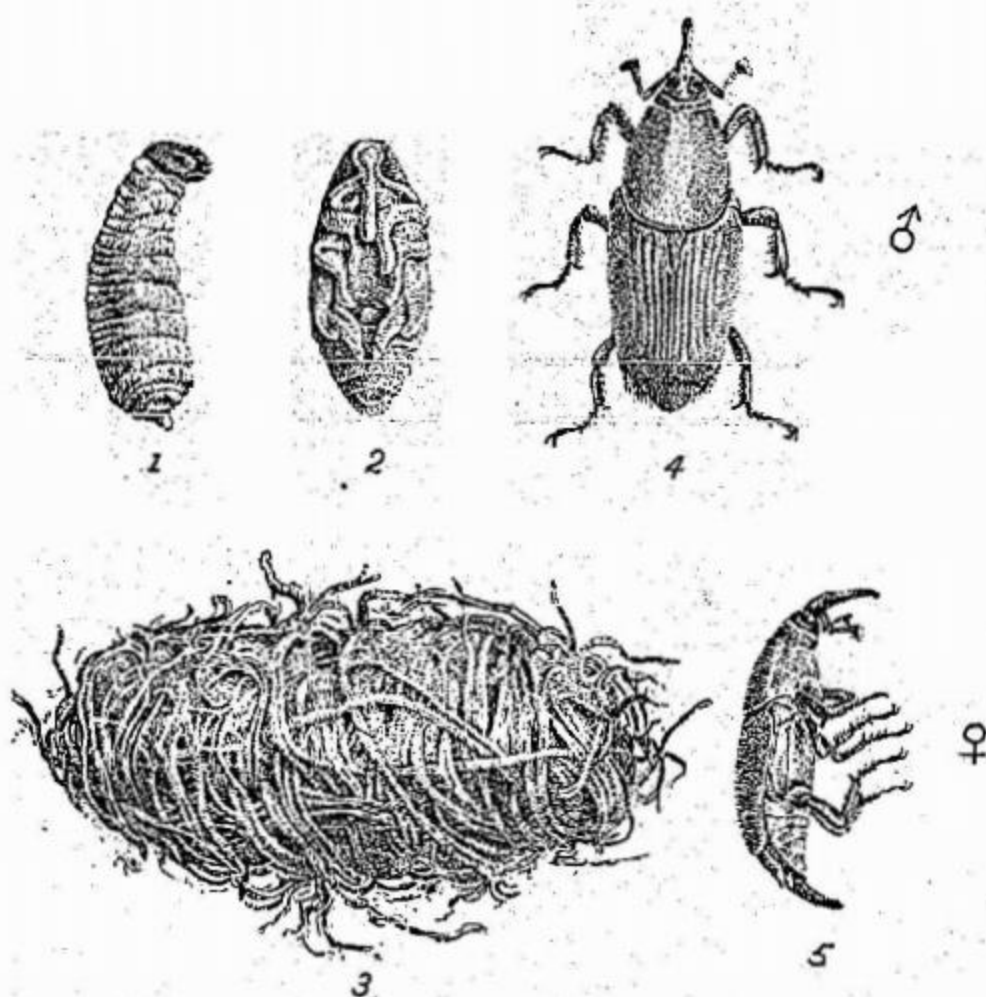


FIG. 1. Larva.
2. Pupa.
3. Cocoon.

FIG. 4. Adult male.
5. Adult female, showing ovipositor.

(b) "*Rhynchophorus ferrugineus*" Oliv.

It is estimated that the losses from preventable causes in this industry for the current year approximately ₱43,000,000, distributed as follows:

Insects and diseases.....	₱15,000,000
Close planting	8,000,000
Use of unripe nuts.....	20,000,000
Total.....	₱43,000,000

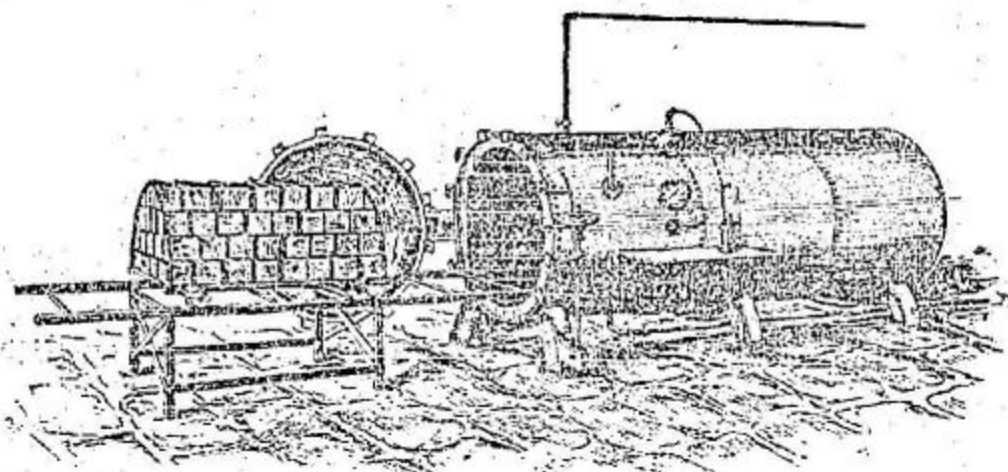
The first of these evils is being corrected in so far as possible by the work of the present forces and although at present the work is only in its preliminary stages the way is being paved for that which will follow later, which is the most important and virtually the key to the situation, viz: The compulsory cleaning up of groves.

Work in the control of pests affecting tobacco.—The work of the year in connection with pests affecting tobacco has been confined to the cigarette beetle, *Lasioderma serricorne* and the tobacco mould, *Aspergillus candida* and has largely been a continuation of last year's work. In connection with the control of the beetle it may be said that the number of cigars treated will equal to 33½ per cent of the entire number exported and total approximately 56,000,000. This amount exceeds by over 100 per cent the number treated in any previous year.

The results of our work in this connection have been assembled and published in the Agricultural Review under the heading of "Some Causes of the Failure of the Manila Cigar on the United States Market and a Remedy," which includes also the means of controlling moulds.

With the possibilities such as are offered by the above method for the control of these two pests of tobacco there can be no further complaint as to their control and the Bureau of Agriculture has in every way vindicated, the position it took several years ago in regard to this matter. With matters as they now stand, two alternatives now present themselves. They are (1) for the Government to make compulsory the treatment of all export cigars; (2) to let things go as they are. The former has everything to commend itself and promises a speedy release from the present troubles which beset the path of the Philippine cigars in the United States. A continuance of the present methods means that the product of those factories who fail to keep their goods free of beetle and mould will continue to reflect upon the Manila product in general and militate against the trade. To this may be added the expense of settling claims for damaged cigars and other troubles incident thereto. Taken as a whole

the Bureau of Agriculture's work in this connection with this problem is ended. The way has been shown and the methods utilized to obtain the desired results have been found to be in every way practicable and applicable to the conditions that prevail in the Philippines.



Vacuum Fumigating Tank for the control of cigarette beetle (*Lasioderma serricorne*) on Philippine cigars. Cigars before being exported should be subjected to fumigation in one of these tanks to guaranty being free of beetles.

Insects and diseases affecting abaca.—With the release of inspectors by virtue of the completion of the work of locust control, another of the problems which this office has been able to take up is insects and diseases affecting abaca. Mention of a disease affecting abaca was made in the report of this office for 1916 which stated that the disease had appeared in Cavite Province. The first report of trouble with abaca was received at the Bureau of Agriculture in October, 1916, from the Municipality of Mendez-Nuñez.

During the present year the malady has extended itself until at the time of writing, it has appeared in the towns of Indang, Silang and Amadeo, in addition to Mendez-Nuñez, from which it was first reported. In accordance with the provisions of Act 2515, a quarantine has been declared in the Province of Cavite prohibiting the transportation of any plants or parts thereof of *Musa textilis* for the purpose of propagation to any other province in the Philippines. In accordance with the same authority, regulation prescribing the duties of owners of abaca plants found to be infected with the disease and the relation of such owners to the representative of the Bureau of Agriculture has been prescribed. These regulations which are listed as Quarantine No. 1 and General Order No. 52 are very specific and leave the determination of the means to be employed in the actual

work of control entirely in the hands of the Insular authorities which it is believed will overcome any trouble which may be anticipated from apathy on the part of those immediately concerned.

There has appeared in the Province of Cavite a disease which threatens to seriously affect the abaca industry in that province and while referred to casually in the report of the year of 1916 no particular mention was made of it and it was not described. The malady in question affects the central developing leaf from causing it to turn yellow and die, and disease extending down the petiole into the heart of the tender stem causing a soft heart rot that is fatal to the plant and renders it useless for fiber. On this work, the Bureau has been able to utilize the services of Mr. Otto Reinking, of the College of Agriculture who kindly consented to coöperate with this Bureau. The pathological investigations have been carried out by him. In this connection he reports that the trouble in question is of bacterial origin. It is interesting to note that the organism in question is new to science, having been identified by Dr. Reinking as *Bacterium spp.* As the disease records a fatality of 100 per cent the Bureau's efforts are being directed to preventing its further distribution. As a preliminary measure to the actual control work a survey has been made and all the abaca lands of Cavite are being plotted for this purpose.

The Bureau's work in the control of rat plagues.—As in most other lines of activity, the Bureau's work in the control of rat plagues has also been extended. During the year one hundred requests for assistance in controlling the pest have been attended to. In all 260 kilos of white arsenic and fifty liters of carbon bisulphide have been distributed gratis in this connection.

Investigations of this pest show that during the past ten years, there have been 129 reports of extensive destruction by rats, more than half of these attacks being confined to rice, the rest being divided between maize, sugar cane and coconuts. In addition to poisons and fumigants distributed gratis to planters, organized campaigns under the Bureau of Agriculture field men have been undertaken in the Province of Rizal. The results in this initial venture are gratifying and in some cases the catch of rodents ran as high as 5,238 rats a day. Campaigns of this nature have thus far received the necessary coöperation of the planters and have reduced the numbers of the rats till their attacks are no longer noticeable. In addition to this, the chief entomologist has prepared for publication a manuscript setting

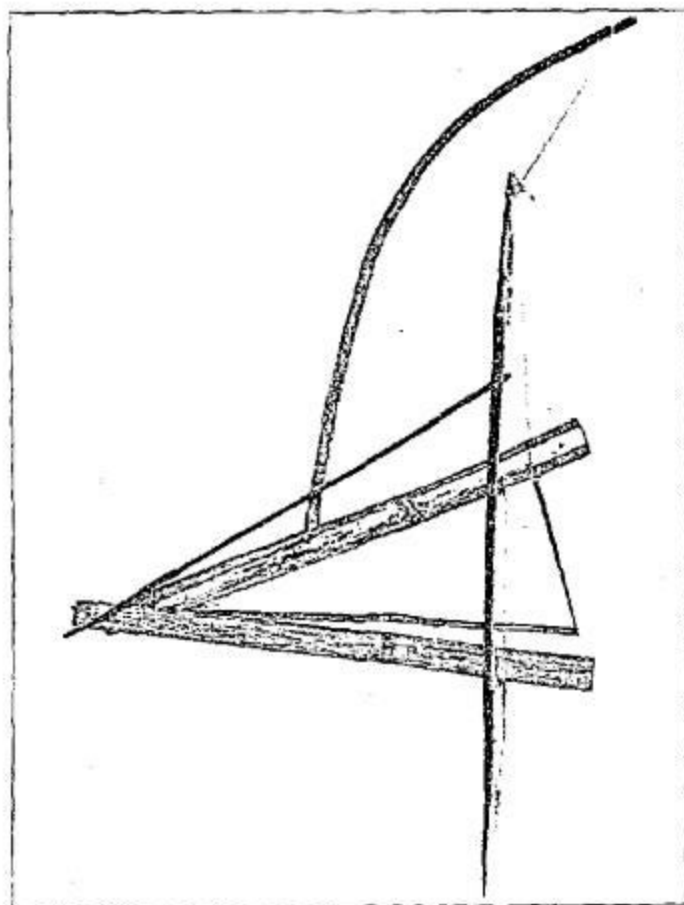
forth in detail the habits and bionomics of each species, their status as agricultural pests and the different methods available in their control.

Insects affecting rice.—There has been few outbreaks of insect pests in this crop though there have been several indefinite reports of damage which have been apparently caused by fungus. Work conducted by Mr. Bonifacio Arce in the control of the rice bug, *Leptocoriza varicornis* promises to furnish a successful solution to this problem which has so long baffled this office. In fact this discovery offers possibilities in the control of that group of the Hemiptera which have so long been immune to the ordinary methods of dealing with insect pests viz: Poisoning, by reason of their mouth parts being suctorial which enables them to obtain their foods without being exposed to the poison. This discovery demonstrates that both the adults and the immature bugs are attracted to the smell of putrid meat and recognize it from a considerable distance and immediately investigate the source. Not only do the bugs come in large numbers to the poisoned baits but feed with avidity on the juices of the meat.

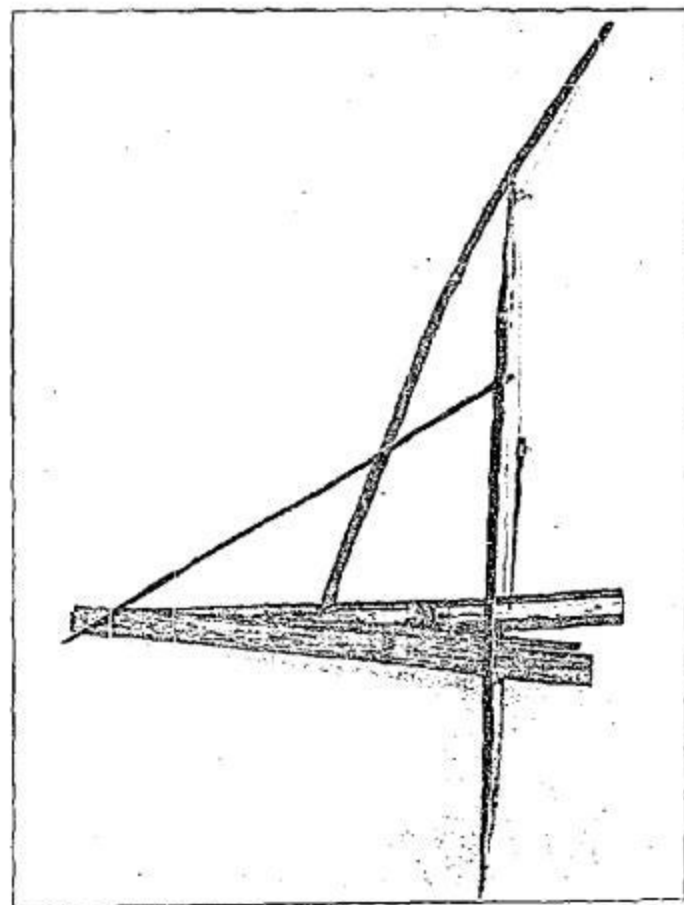
Field demonstrations have shown that the meat tied up in small bags and suspended from poles well located in open land will rapidly be covered with feeding bugs. While our investigations are not yet completed it has been found that a three per cent solution of arsenate of soda mixed with the meat will kill any bug that partakes of it. Until further experiment demonstrates that trapping or some other method in conjunction with this kind of bait, the poison method will be utilized. The next step will be to ascertain the best time to conduct the campaign. Present observations seem to point to the fact that the period just before the rice heads out will be productive of the best results. However, this will readily be found out by experiment.

Fungus diseases.—Of the fungus diseases present on rice a very pronounced case comes from the district of Cabanatuan, Nueva Ecija. Examination of diseased plants show the cause of the trouble to be the fungus *Ustilago virens*. This is a fungus which affects the heads of the rice causing their grains to become swollen and covered with a deep orange colored powder which is the fruiting bodies of the organism. As this class of disease can largely be controlled through treatment of the seed with copper sulphate, it is believed that the control of this outbreak will be affected at the coming planting season.

From the Lamiao station a report of a disease of rice that is new and hitherto unreported was received. This disease has



(a) Open.



(b) Closed.

Effective bamboo guillotine rat trap used by the people of Taytay. Traps are placed on rat trails or on ricepaddies.

all the appearance of being of possible economic importance. It has been identified by the mycologist of the Bureau of Science as *Phyllosticta miurai* Miyake. Another report of which investigation was possible was received from the Sual district of Pangasinan. To judge from the correspondence, as no specimens were forwarded, this latter disease was caused by one of the rusts.

Investigations relative to pests and diseases of sugar cane.—There has been little done under this heading. Complaints from this source for the year have been practically nil. From San Jose, Mindoro, however, comes a report of a disease which from present indications point to a possible futural trouble. From the appearance of infected plants, it would seem that the disease in question is what is commonly called the Fiji disease. This is one of the most dangerous of all the known diseases of cane and is most rigidly quarantined against by all cane growing countries. It is characterized by the formation of gall like swellings of the midrib of the leaves and a failure of the plant to grow beyond the formation of a tussock similar to a stool of marsh grass.

The pathogenic agent is a member of the lowest group of organism, *Plasmodiophora*. The great danger to be anticipated from this disease is the fact that the organism propagates with equal facility in the soil, so that once the disease appears in a district its eradication becomes almost an impossibility.

Pests and diseases of citrus. Work along these lines has been limited to the collection of insect pests noted feeding upon the various members of this group. While these investigations are of no great importance they have added considerably to our available knowledge of the season broods. One case in particular is that of a hitherto unreported *Aleyrodid* closely resembling *Aleyrodes citri*, and which will probably be found to be closely related to that species, if not identical. The only other work with this group has been of a coöperative nature with Mr. H. A. Lee, of the United States Department of Agriculture, who is investigating the possibility of the control of citrus canker.

Plant inspection service.—This branch of the service shows a healthy growth. In pursuance with recommendations made in the report of 1916 it has been possible to secure authority for the appointment of three new Filipino inspectors to this branch of the service. Perhaps the most important innovation is the opening of a plant inspection office at Zamboanga and making a permanent detail to that port.

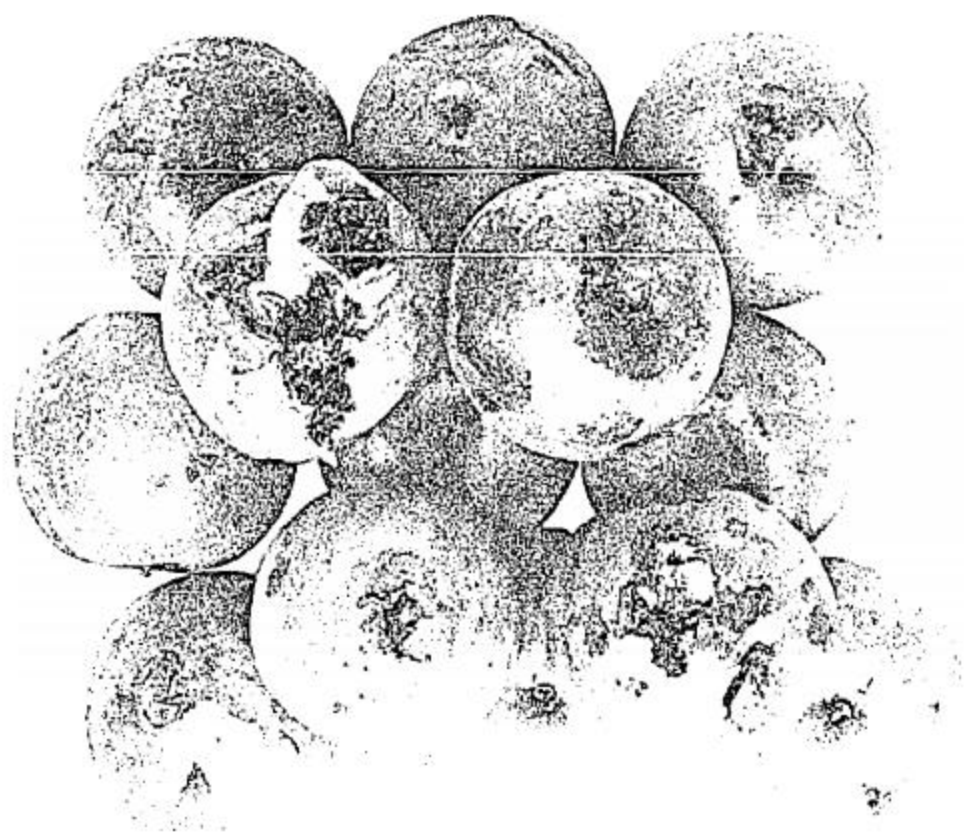
The insectary at Singalong experiment station has been remodelled and enlarged for the purpose of making it into a research and quarantine laboratory. The present change will double the size of the building which now houses the fumigating equipment of this branch of the service. This arrangement allows for the examination, fumigation and destruction of all material and is also of signal assistance to other divisions.

In accordance with Act 2515, new regulations covering the inspection of imported plant material have been promulgated as General Order No. 1, restricting the shipment of abaca for propagation purposes has been put into force. The records of the office show that during the year under consideration certificates covering the inspection of 3,948 packages of seed and plant material were issued. During the year 21 species of insect pests have been intercepted on incoming shipments. There has been considerable falling off in the number of export shipments inspected due to a decrease in the number of orchids exported, this decrease being due entirely to the war.

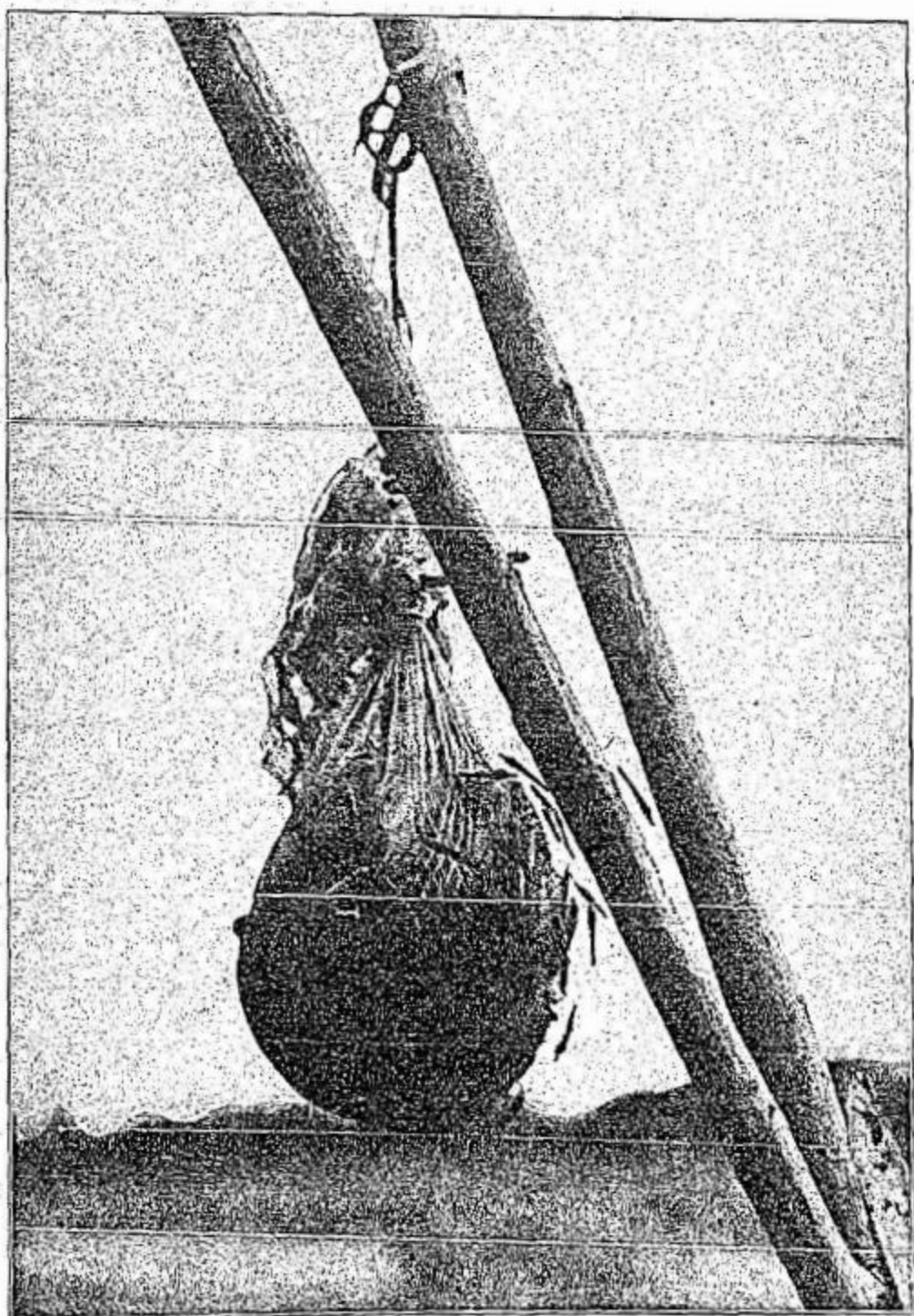
Educational propaganda.—The office's activities in this line have been continued and have been productive of excellent results. During the year, educational work has been taken up in connection with budrot of coconuts, abaca rot, rat control in rice, coconuts and sugar cane and the control of the rice bug. Propaganda in connection with budrot was conducted in La Laguna, Tayabas, Department of Mindanao and Sulu and in Pangasinan; that relative to rats in Rizal, Pampanga, and Tarlac; that in connection with our work on the rice bug was made in Bulacan and Cavite Provinces.

Work in Apiculture.—Experiments with honey bees have been of necessity slighted. The colonies of *Apis indica* are in a thriving condition and have shown no desire to abscond. The same holds true of those of *A. mellifica*. Work with *A. dorsata* has been confined to securing good series of photos of this species as there has been no time to give this subject the individual attention which it needs.

Coöperative work.—During the year, representatives of the United States Department of Agriculture and the State of California have made extended visits to the Islands in connection with pest control work. Mr. Lee of the Federal Department of Agriculture as previously stated is engaged in investigations relative to the possible control of citrus canker. For this purpose the entire citrus collection at the Linao experiment station has been put at his disposal. Mr. C. P. Clausen visited the



Pear fruits attacked by moth borer.



Leptocoriza varicornis Fab., sucking the juice of putrified meat.

Islands for several months for the purpose of securing possible parasites of insects destructive to citrus fruit in the State of California. To judge from the hearty letter of thanks received from the State Commissioner of Horticulture in California, the assistance extended was duly appreciated. It becomes more apparent year by year that by aiding other countries in this way a courteous and helpful service to others is performed and reciprocal service of a similar kind is willingly and courteously rendered.

Acknowledgments. A report of this nature would not be completed without making due acknowledgments of assistance received from outside sources. The Bureau is particularly in debt to the officers and men of the Philippine Constabulary. Their work in patrolling the uninhabited domain has been of inestimable value in connection with locust control and has more than any other thing been responsible for the successful termination of this campaign.

To the Bureau of Entomology and other Bureaus of the United States Department of Agriculture particularly to the former the thanks of the Bureau are due for the identification of specimens.

FIBER DIVISION

PERSONNEL

The personnel of the fiber division during the fiscal year ending December 31, 1917, consisted of a chief, thirteen inspectors, three acting inspectors, twenty-two assistant inspectors, four assistant agricultural inspectors, nine clerks, and several laborers.

As in previous years, the force of fiber inspectors attended to the inspection of the grading of fiber in the different fiber-grading establishments and to the issuance of the proper certificates of inspection on all fiber graded and baled in accordance with Act 2380 of the Philippine Legislature. The assistant inspectors performed their duties in helping the inspectors in the supervision of the grading of fiber at the press or presses to which they were assigned, as well as to check and stamp all bales submitted for inspection. A number of assistant inspectors were detailed during the year to carry on an educational campaign among the producers in the more important fiber-producing provinces, with the end in view of bettering the quality of fiber, as well as to advise them from time to time of the current market prices of fiber.

During the year the fiber division lost through resignation the services of four of its American inspectors of whom Mr. M. M. Saleeby, its first chief, was one. On the other hand, a Filipino was promoted to the position of second assistant chief of the division, together with a number of others who were promoted to the position of inspectors as a result of qualification by passing the fiber inspector examination as required by the Bureau of Civil Service. Three of the assistant inspectors, because of very efficient service rendered by them since the beginning of the fiber inspection work, were given assignment as acting fiber inspector in charge of station.

SCOPE OF WORK.

The most important work performed by the fiber division during the year covered by this report was the enforcement of the fiber grading and inspection law (Act 2380), and also investigation and experiment on abaca (Manila hemp), Agave and allied fibers, kapok, cotton, and miscellaneous tropical fibers of commercial possibilities. The distribution of fiber plants and seed was performed by the seed and plant distribution office of the Bureau, in coöperation with the fiber division.

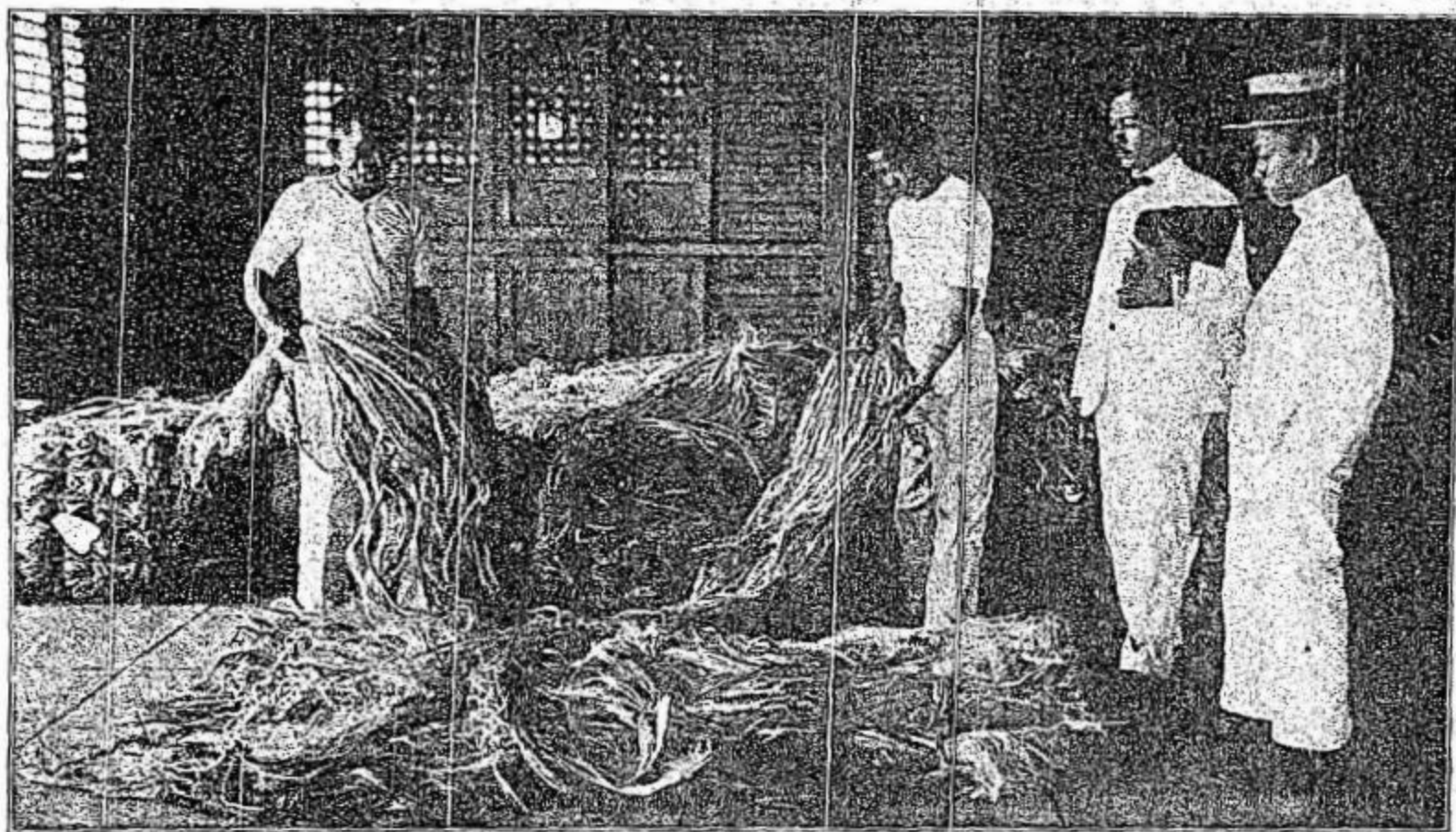
FIBER GRADING AND INSPECTION.

The system of grading and inspection during the year just past was, on the whole, conducted in a most satisfactory manner. The grading establishments having profited by their experience of the previous years by becoming thoroughly acquainted with the official standard of grading and the prescribed regulations governing the baling of fiber, contributed materially in minimizing the frictions between them and the inspectors, as was the case during the first years of the enforcement of the fiber grading law.

Hardly any difficulty worth mentioning was encountered in this year's work of the division, save perhaps the tow and strippy fibers which came mostly from Sorsogon and the north-western part of Samar, the various colored fiber from Jolo, and the coarse and strippy but high colored fiber from northern Mindanao. The tow condition of Sorsogon and Samar fiber was due mainly to the fact that the hanks once in the godowns and the coarse strips are separated, the resulting effects are the tow which are invariably found in the high-grade fibers coming from these districts. In the case of Jolo and north Mindanao fibers, the trouble here was that ever since the enforce-



A group of Government fiber inspectors with some government laborers and bodega men.



Government Fiber Inspectors making the inspection of bales.

ment of the fiber grading and inspection law, no educational inspector has ever been assigned to these provinces through lack of a proper personnel who can handle the situation. However, this division expects soon to be able to relieve this want by the employment and training of a Moro from the Department of Mindanao and Sulu.

Grading station and establishments.—During the year just past, there were designated thirty-four grading stations and 101 grading establishments, an increase of four stations and four grading establishments over the previous year.

Of the one hundred and one establishments operating under the fiber grading law, there are only twenty-four establishments that still use special house marks for each grade of the Government standard. They were classified as follows: First-class, 8; second-class, 12; third-class, 5; fourth-class, 29; fifth-class, 20; and sixth-class, 27. The class of establishments is determined by the number of bales graded and baled per year. First-class establishments handle 40,000 bales or more; second-class, 20,000 to 40,000; third class, 16,000 to 20,000; fourth-class, 8,000 to 16,000; fifth-class, 4,000 to 8,000; and sixth-class, under 4,000 bales.

Inspection stations.—Seventeen inspectors, three of whom were acting, were assigned to inspect fiber during the year, a gain of two inspectors over the previous year. These inspectors were assigned to the following stations: Manila, 2, besides the chief; Cebú, 2; Legaspi (including Ligao) 1; Tabaco, 1; Lagonoy, 1; Sorsogon, (including Gubat), 1; Casiguran, 1; Calbayog, 1; Tacloban, 1; and Surigao, 1; and the rest are either on leave of absence or resigned.

Quantity of fiber graded and inspected.—Accurate reports on the quantity of fiber graded, baled, inspected and certified to every month, by grades and provinces, were regularly prepared during the year as in the past. These monthly reports were distributed to both local and foreign buyers and manufacturers, and our list of subscribers has been continually growing, which emphasizes the value of these reports to the trade in general.

The Government fiber inspectors, during the year 1917, inspected, stamped and approved 1,291,851 bales of abaca (Manila hemp), and 113,579 bales of maguey and sisal, and also 1,553 bales of pacol and canton. During the past year, 21,228 bales of abaca and maguey were rejected as not being up to the proper standard.

There were produced a total of all fibers during the year 1917,

1,406,983 bales, an increase over the total of the previous year of 101,831 bales.

Receipts and expenditures.—The total allotment to the fiber division for the year 1917 was ₱123,395, a considerable amount of which was not expended by this division. The following collections were made by the fiber division for the year 1917:

License fees for grading permits.....	₱20,350.00
Inspection fees on abaca fiber.....	129,185.00
Inspection fees on the rejected abaca and maguey.....	2,122.80
Inspection fees on maguey, sisal and paco.....	11,513.20
Total	163,171.00

The above total collected for the fiber division does not include small amounts collected during the year for the sale of standard samples, nor does it include the items for the sale of abaca and maguey suckers. The fiber division is not only self-supporting but is the source of considerable revenue to the Government.

General remarks.—The year 1917 has been a very favorable year for the fiber industries, in so far as weather conditions are concerned. No typhoons nor floods of any serious character have visited the fiber provinces during the year, and the abaca plantations in the southern Luzon provinces are reported to have fully recovered from the effects of the typhoons of 1915. This condition, it is believed, is conducive to still further material increase in the production of abaca and maguey throughout the Archipelago.

The most notable change in the abaca production during 1917 was the great increase of the good and excellently cleaned grades and a corresponding decrease in the production of the coarse and Daet grades. This improvement was the direct results of the work of our educational inspectors throughout the abaca producing districts in their effort to educate the producers to improve the method of stripping in order to procure the very satisfactory prices being paid for the excellent and well-cleaned grades.

The price obtainable on the local market for abaca and maguey fiber throughout the year 1917 was most satisfactory. In fact, during a great period of the year 1917 the market price of abaca fiber reached a maximum never before obtainable in the Philippines.

During the latter part of the year 1917, the Bureau of Agriculture received the Prieto maguey extracting machines, which were ordered in the early part of the year, and immediately had them installed at Singalong experiment station and began ex-

perimenting with the view of adjusting these machines to the adaptability of stripping Philippine maguey. The results obtained were very satisfactory and it is believed by the undersigned that these machines will give perfect satisfaction and greatly increase the maguey industry throughout the Philippine Islands, and put it on a more staple basis.

Coöperation of the United States Department of Agriculture in fiber investigations.—During the previous fiscal year tentative arrangements were made by the chief of the fiber division, in conference with officials of the United States Department of Agriculture, for coöperative work in promoting the interests of the binder-twine-fiber industry in the Philippine Islands. Appropriations covering the cost of this work were subsequently obtained, and in June, 1917, a specialist in fiber-plant production was detailed by the United States Department of Agriculture for duty in the Philippine Islands.

The development of our maguey and sisal industries, both by increasing the production and by improving the quality of these fibers, is a matter of vital interest to the farmers in the maguey-producing provinces. As a result of the increased demand on the part of American farmers for binder twine, due in part to war conditions, together with the existing high prices and the possibility of a world's shortage of binder-twine fiber in these Islands has attracted considerable attention in the United States.

The purpose of this coöperative work is to facilitate, by reason of increased funds and personnel, the continuance of work already organized by the Bureau of Agriculture, and the extension of this work along such lines as may seem desirable.

The coöperative work that has been carried on during the latter part of the current year has included investigational and publicity work in the maguey provinces, and the testing of fiber-cleaning machines at the Singalong station in the city of Manila.

EXPERIMENTAL WORK.

The experimental and extension work is carried on by the fiber investigation section of this division. The experimental work is being conducted, mainly, at La Carlota experiment station, La Carlota, Occidental Negros. Several experiments are in progress; they are grouped as follows:

- I. Abaca.
- II. Agave.
- III. Kapok.
- IV. Cotton.
- V. Miscellaneous fiber plants.

This work is all continuous, and has now been in progress for several years, but it seems desirable that it should be continued for some time longer before publishing results. The extension work is carried on firstly by distributing plant materials to the old and prospective growers, secondly by a sort of an extensive campaign all over the Islands. This comprises practical talks and lectures to farmers throughout the year. Coöperative experiments are conducted, the work being done by the grower under our direction. These coöperative experiments, we believe, are one of the most effective types of extension work. And thirdly by correspondence, which is increasing yearly. Prompt attention is given to the letters of inquiry received by this office during the year. It is the policy of the fiber investigation section to have such correspondence attended to promptly, giving desired information so far as it is known. Several letters of this nature were written during the year. Additions to the force of the fiber investigation section will make it possible to prosecute this work with greater vigor during the coming year, and this will add some new lines of investigation, and sufficient men to run the campaign.

Abaca (Manila hemp) investigations.—There are planted in adjoining experimental plots at La Carlota experiment station the most common varieties of the abaca plant which are cultivated in south Mindanao (Davao), east Leyte, south Luzon (Lagonoy, Camarines), and Occidental Negros. In addition to the three fields that have been planted in the previous years, a fourth field was started this year. The nature and purpose of planting these four fields and the interesting results obtained therefrom may be briefly but fully stated in the following manner:

Variety tests.—In order to study the distinguishing characteristics of the degree of hardiness, rapidity of growth, the proportion of fiber contents to the raw material, the quality and tensile strength of the fiber and the facility of fiber extraction in each of the varieties cultivated in the regions mentioned above, field No. 1, was started in 1912. Last year, experiments along these lines were almost completed in all the varieties grown, with the exception of those varieties from south Luzon, which were determined this year.

It is intended that a work of this kind be continued for some time longer before publishing results. As has been stated, addition to the force of this section will make it possible to prosecute this work with greater vigor during the coming year, and thus

will add some new lines of investigation to what have already been accomplished.

Repeated variety tests.—Owing to the fact that the extent of growth and development at La Carlota of most of the south Mindanao and east Leyte varieties has been inferior to what the same varieties exhibit when grown in their respective native localities, it was deemed necessary to repeat the whole series of variety tests by planting a new field designated as field No. 2, in which all the varieties of all the districts are propagated from rootstocks obtained from the first field. It is believed that the second generation of plants will give better results than the first generation, due to the fact that the former will be better adapted and acclimated to local soil and climatic conditions. This field was started on June 20, 1916, and the varieties grown, have not, with the exception of the Ilayas and Kala-ao, which flowered in July and October, respectively been sufficiently developed to enable us to make a full study of their characteristics as compared with the varieties grown in field No. 1.

Propagating abaca for distribution.—It has been found that the demand for abaca suckers is growing larger and larger from time to time and for this reason, we have decided to start two more new fields of abaca. The purpose of which is to propagate the most desirable varieties and distribute same to the various abaca growers of the Islands. These fields are designated as field No. 3 and field No. 4. They were planted on September, 1916, and May, 1917, respectively. Field No. 3 was planted with suckers while field No. 4 was planted with rootstocks.

Propagating abaca from seed.—Repeated experiments were conducted at La Carlota experiment station in order to determine the merits of this method of propagating the abaca plant, and it has been found that the conclusion drawn from these experiments in the previous years, holds good in conformity with the results obtained this year. Experiments at La Carlota have demonstrated that this method of propagating from seed is undesirable.

AGAVE INVESTIGATIONS.

Experimental work.—In August, 1912, the following Agave species were planted in experimental plots at La Carlota experiment station:

- Maguey (Agave cantala).
- Sisal (Agave sisalana).
- Henequen (Agave fourcroydes).
- Zapupe (Agave zapupe).

In addition to the above, a few plants of Mauritius hemp (*Furcroya foetida*) were set out at the same time in an adjoining plot.

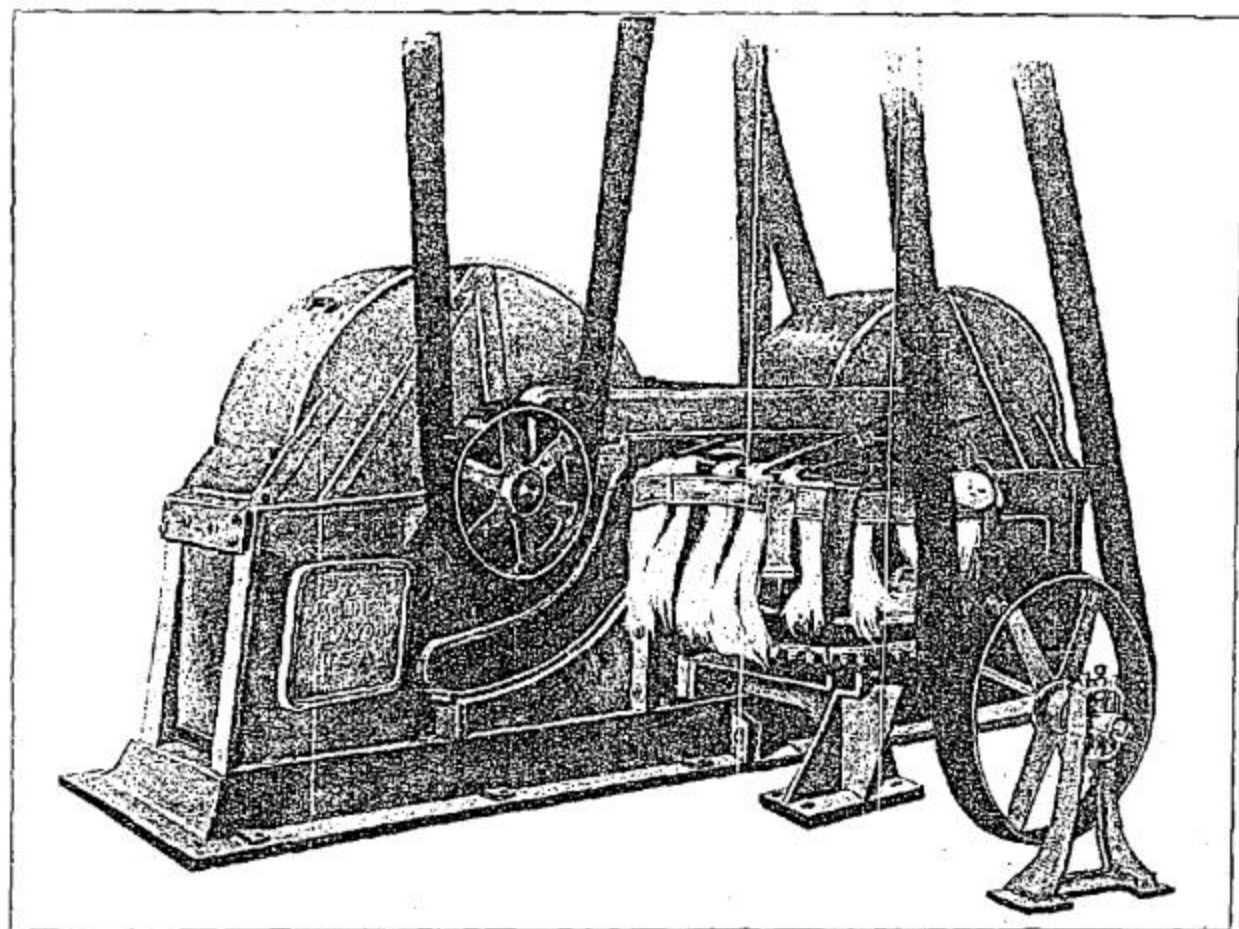
Maguey (Agave cantala).—There are at present four different plots of maguey. Plot No. 1 consists of 2 rows of plants, one grown from suckers and the other from bulbils. There are 22 hills in a row. Five exceptionally good plants from each row are selected for determining the percentage of fiber. While these selected plants have not yet reached maturity, an experiment to determine the percentage of fiber obtained by the processes of knife stripping and water retting was performed.

Investigations show that the maguey plant is on the whole well adapted to soil and climatic conditions in the Philippines. It can also be observed that of all these species maguey produces the highest percentage of fiber. Maguey exhibits longer but narrower leaves than sisal. Owing to its low percentage of fiber content, the Mauritius hemp is considered inferior to the remaining species. For the same reason, the Zapupe species is not considered as desirable for cultivation in the Philippines as either the maguey or the sisal.

Status of industry.—Statistics show that the production of maguey fiber for export from the Philippine Islands commenced in the year 1904, when the quantity of fiber exported was only 690 metric tons, valued at ₱156,242. Between the years 1905 and 1915, inclusive, the quantity exported varied between 2,000 and 7,000 metric tons, and the value between ₱326,546 and ₱1,181,902, the highest figures being for those of the year 1913. Last year, 15,686 metric tons were exported, valued at ₱3,493,142. This phenomenal increase of production during 1916, is due to the material improvement in the preparation and grading of the fibers, as a result of the application of the fiber inspection and grading law; and by the considerable rise in price of all cordage fibers, on account of the European war.

Again, this increase in the quantity and value of maguey production has aroused considerable interest in this fiber throughout the Philippine Islands. A large number of requests for maguey and sisal plants has been received by this division during the year, both from old and prospective producers. All these requests have been complied with, by furnishing suckers and bulbils from the plants we have at La Carlota.

Practically the entire quantity of maguey is still being produced by the retting method, and this office fully realizes that during normal years such a product can not compete on favorable terms with the Henequen or the sisal of German East Africa, Mexico and Java, all of which are cleaned by machinery.



Priolo stripping machine for maguey and sisal.

On this account, an effort has been made by this division to obtain funds from the Philippine Legislature, in order to purchase stripping machines, and operate same for demonstration purposes. This year an appropriation was made available and two Prieto stripping machines were bought from Prieto Machine Company, New York. They are at present temporarily installed at Singalong experiment station, under the supervision of our mechanic and superintendent of repair shops of this Bureau.

These two machines are operated from time to time for the purpose of demonstration. After a series of demonstrations, one will be sent to Ilocos district and the other to Cebu, where extensive cultivation of maguey and sisal is carried on.

KAPOK INVESTIGATIONS.

Experimental work.—There are twelve rows of kapok trees planted at La Carlota. Eight rows are propagated from seed, the seed having been planted in the nursery in August, 1912, and transplanted to the permanent field in September, 1913. Four rows are propagated from cuttings, which were set out in August, 1912. In addition to these four rows, four more were added in the latter part of the same year.

This year, the kapok trees were at their flowering stage from January to March, and four harvests were made. The harvesting of the pods was started in April and ended in July. The trees were beginning to set out new flowers at about the middle of December. In order to determine the yield of pods of average trees grown from seed and from cuttings, six plants were selected from each of the eight rows in each case.

The figures obtained show that the trees grown from seed produced more pods of kapok than those grown from cuttings. Aside from this quality of producing a larger number of pods, trees grown from seed exhibited a more uniform growth, the trunks and branches being smoother and more regular than the trees grown from cuttings, although the latter are larger in size and height. Furthermore, the pods produced from the former trees were of a much more uniform size than those from the latter trees.

Status of industry.—No new developments have taken place in this industry during the year. There is at present at the Singalong repair shop of this Bureau, a machine for cleaning kapok. In 1916, a machine was built by the office of construction and repairs of the United States Naval station at Cavite,

and said machine has given very satisfactory results in separating the kapok fiber from the seed. The fiber division coöperated with the above office by furnishing plans and data of similar machines used successfully in Java. Now that the question of adequate cleaning machine for kapok is solved, it is hoped that the commercial development of this product will be enhanced at a much more rapid rate than heretofore. This division is fully equipped with information on all phases of the industry which all prospective producers and exporters may require for its proper development and extension.

COTTON INVESTIGATIONS.

Experimental work.—The experiments made last year with the growing of American upland type of cotton as well as native types, gave discouraging results, but to find out the defects of such results, further experiments with these plants were again conducted this year. Although present indications point to better results than those of last year, it is believed that repeated tests are necessary before a final decision can be rendered as to whether it is advisable to grow them on a large scale for commercial purposes or to grow them simply for home use. During the year another consignment of seed of Sea Island cotton was received from the United States Department of Agriculture, and same has been planted in experimental plots at La Carlota. The good results obtained from last year's planting indicates that continuous propagation of same is advisable for the purpose of distributing the seed to various cotton growers of the Islands. A large quantity of seed of this variety obtained from our trees planted last year, was distributed and it is hoped that this species will give good results. Our experiment shows that our soil and climatic conditions are favorable for the growing of Sea Island cotton and that same will thrive well. As has been stated in the previous report, the value and use of the Sea Island cotton have recently considerably increased on account of its suitability for use in the manufacture of rubber tire fabric for automobiles and other similar motor vehicles.

The newly planted varieties this year, in addition to those abovementioned, are the Balawan Light Brown and Balawan Brown, from La Union; "Soot" Light Brown and "Soot" Brown, from Batangas; and Toquillo and Burac, from Antique.

MISCELLANEOUS FIVER INVESTIGATIONS.

Panama-hat plant.—In our station at La Carlota, an area of 2,722 square meters was planted to 24 rows of 22 hills in a row of this plant.

The first planting of this plant was started in 1913, and the suckers were obtained from the old plants secured from Lamao experiment station.

The object of planting this plant is simply to be able to meet any demand for plants in case the Bureau of Education succeeds in developing a good weave of Panama-hats. The plants are exhibiting luxuriant growth, which indicates that this plant is adapted to our local soil and climatic conditions. The plants are now producing numerous suckers.

*Roselle (*Hibiscus sabdariffa*).*—There are at present growing at the station four plots of white roselle and two plots of red roselle. Of these plots three of the white roselle plots and one of the red roselle plots are for propagation and distribution purposes. The other two are for the purpose of conducting an experiment on the "plant-to-the row-test" culture.

*Ramie or China grass (*Boehmeria nivea*).*—In March 28, of this year, the plants were cut down to encourage the growth of the young shoots. The shoots grew rapidly and one month later the stems vary from 100 centimeters to 126 centimeters high. Two months after the first cutting, the second one was made for the same purpose. In less than a month later, the average height of the plants was 135 centimeters an increase of 10 centimeters. Since then, the plants were allowed to grow until their fruits reached maturity, and until enough stems were ready to be harvested for fiber extraction. Considerable success was obtained from repeated growing of this plant, and it can safely be stated that its cultivation can successfully be carried out in the Philippines. The fiber possesses superior qualities, and it is well known in all the fiber markets of the world. We are continually propagating this plant so as to be able to meet any demand for it.

CONCLUSION.

As in the report of the previous year, many of the statistical tables such as sale of animals, livestock purchases, breeding records, inspections, publications, fiber statistics, sugar and other plant propagation records, laboratory tests, etc., were not incor-

porated in this report on account of economizing both time and space in its preparation. However, these statistical tables are available in every instance where more detailed information may be desired.

Respectfully submitted.

ADN. HERNANDEZ,
Director of Agriculture.

To the Honorable,
the SECRETARY OF AGRICULTURE AND
NATURAL RESOURCES,
Manila, P. I.

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